Operation and Maintenance Report January 2011 to December 2011 McCormick and Baxter Superfund Site Portland, Oregon

Prepared for Oregon Department of Environmental Quality

May 23, 2012
15670-06/Task 5

GSI Water Solutions, Inc.

HARTCROWSER

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Expires: 12-31-2012

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ACRONYMS

ACB	Articulated Concrete Block
ACLs	Alternate Concentration Limits
AWQC	Ambient Water Quality Criteria
BES	Bureau of Environmental Services
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Clearwater	Clearwater Environmental Services, Inc
cPAHs	Carcinogenic Polynuclear Aromatic Hydrocarbons
DEQ	Oregon Department of Environmental Quality
DNAPL	dense non-aqueous phase liquid
EPA	United States Environmental Protection Agency
FWDA	Former Waste Disposal Area
GSI	GSI Water Solutions, Inc.
IGA	Intergovernmental Agreement
LNAPL	light non-aqueous phase liquid
MCL	Primary Drinking Water Standard Maximum Contaminant Level
µg/L	microgram per liter
mg/kg	milligram per kilogram
mg/L	milligrams per liter
ng/L	nanograms per liter
NAPL	non-aqueous phase liquid
NAVD	North American Vertical Datum of 1988
NOAA	National Oceanic and Atmospheric Administration
NRWQC	National Recommended Water Quality Criteria
O&M	Operation and Maintenance
PAHs	polynuclear aromatic hydrocarbons
PCP	pentachlorophenol
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
Site	McCormick & Baxter Creosoting Company Site
TRM	turf reinforced matting

OPERATION AND MAINTENANCE REPORT
JANUARY 2011 TO DECEMBER 2011
MCCORMICK AND BAXTER SUPERFUND SITE
PORTLAND, OREGON

1.0 INTRODUCTION AND PURPOSE

This Operation and Maintenance (O&M) Report has been prepared for the Oregon Department of Environmental Quality (DEQ) to document the O&M activities implemented at the McCormick and Baxter Superfund Site (Site) located in Portland, Multnomah County, Oregon, between January 1, 2011, and December 31, 2011. The location of the Site is shown on Figure 1. Figure 2 presents the Site layout and features, and Figure 3 presents the Site layout with surface elevations. Figure 4 presents historical non-aqueous phase liquid (NAPL) distribution, Figure 5 presents current Site use restrictions, and Figure 6 presents historical contaminant areas. This report has been prepared by DEQ's contractor team, Hart Crowser, Inc., and GSI Water Solutions, Inc. (GSI).

O&M activities are identified in the *Draft O&M Plan* (DEQ, 2007), prepared by DEQ and approved by the United States Environmental Protection Agency (EPA). The *O&M Plan* defines the administrative, financial, and technical details and requirements for inspecting, operating, and maintaining the remedial actions at the Site. The March 2010 revised *O&M Manual* (Hart Crowser/GSI, 2010a) specifies the sampling and monitoring procedures, quality assurance and quality control, technical information, and data necessary for implementing O&M activities. The scope and frequency of O&M activities conducted at the Site was reduced in 2011, as compared to the past several years. The *O&M Plan* and *O&M Manual* will be revised in 2012 to reflect the reduced long-term monitoring requirements and associated procedures.

This O&M Report documents the operation, monitoring, and maintenance activities that occurred in calendar year 2011. The O&M performance standards and plan activities are provided in Section 2, and the O&M activities conducted at the Site in 2011 are summarized in Section 3. Section 4 discusses planned activities for 2012. Detailed presentations of these O&M activities are provided in the following appendices:

- Appendix A – Groundwater and NAPL Monitoring
- Appendix B – Site Observation and Activity Summary
- Appendix C – Vegetation Management

This O&M Report has been provided to the DEQ in hard copy and in electronic format on compact disc (CD). It should be noted that the CD contains material not provided in the hard copy report including: site inspection notes, status meeting summaries, etc.

O&M activities were implemented primarily by DEQ's contractor, Hart Crowser, and their teaming partner GSI (under subcontract to Hart Crowser). Hart Crowser also used the following subcontractors for support of site activities including Clearwater Environmental Services, Inc. (Clearwater) for routine operation, monitoring, and maintenance activities through June 2011 and Native Ecosystems NW, Inc., for noxious weed control.

Key personnel for implementation of O&M activities include:

- Scott Manzano: Oregon DEQ Project Officer
- Steve Campbell: Oregon DEQ Contract Officer
- Rick Ernst: Hart Crowser Program Manager
- Heidi Blischke: GSI Technical Manager
- Tim Skrotzki: Hart Crowser Site Manager

2.0 OPERATION AND MAINTENANCE PERFORMANCE STANDARDS AND ACTIVITIES

As discussed in Section 1, O&M activities are identified in the draft October 2007 *O&M Plan* with modifications as described in appropriate sections of this O&M Report and the 2010 revised *O&M Manual*. Performance standards and activities of the October 2007 *O&M Plan* are described below.

2.1 Soil Remedy

The soil remedy consists of contaminated soil removal and construction of an upland soil cap on approximately 40 acres of the Site. The soil cap remedy was completed in September 2005. Long term monitoring is necessary because soils beneath the cap remain contaminated with arsenic, pentachlorophenol (PCP), polynuclear aromatic hydrocarbons (PAHs), dioxins, and NAPL. The performance standards for the soil cap, determined in the Record of Decision (ROD) (EPA, 1996) and specified in the *Draft O&M Plan*, are as follows:

- Maintain contaminant concentrations in surface soil below the following risk-based clean-up goals, as specified in the ROD (EPA, 1996):
  - Arsenic – 8 milligrams per kilogram (mg/kg);
  - PCP – 50 mg/kg;
  - Total Carcinogenic PAHs (cPAHs) – 1 mg/kg; and
  - Dioxins/furans – 0.00004 mg/kg.
- Maintain the topsoil layer to within 50 percent of its design specification:
  - Area over impermeable geomembrane cap – maintain thickness of at least 6 inches; and
  - All areas except over impermeable geomembrane cap – maintain thickness of at least 12 inches.
- Minimize infiltration of rainwater within the subsurface barrier wall by maintaining a subsurface stormwater conveyance system.
- Minimize stormwater erosion and surface water ponding by maintaining Site grading, surface stormwater conveyance, and native vegetation.
- Maintain native vegetation within the 6-acre riparian zone for compliance with the National Marine Fisheries Service Biological Opinion (National Oceanic and Atmospheric Administration [NOAA], 2004).

Monitoring activities for the soil cap (including the riparian zone) include visual inspections of the cap surface, stormwater conveyance system, security fencing, and warning signs. The soil cap is designed to be generally maintenance free, except for maintaining the native vegetation. Routine maintenance includes semi-annual manual removal of invasive plants and targeted application of herbicides. Non-routine maintenance may include repairs of the fence, replacement of warning signs, repairs of the gravel roads, filling of potential animal burrows, removal of sediment from manholes, and replanting unsuccessful trees and shrubs. The planned frequency for these activities through September 30, 2016 (the date the fourth Five-Year Review is due), is provided in Table 1.

2.2 Sediment Remedy

The sediment remedy consists of a sand and armor cap, constructed over 23 acres of contaminated sediments within the Willamette River. The sediment cap remedy was completed in September 2005. Long-term monitoring and maintenance is necessary because sediments beneath the cap remain

contaminated with arsenic, PCP, PAHs, dioxins, and NAPL. The performance standards for the sediment cap, determined in the ROD (EPA, 1996), and specified in the October 2007 *O&M Plan*, are as follows:

- Maintain contaminant concentrations in surface sediments below the following risk-based cleanup goals, as specified in the ROD (EPA, 1996):
  - Arsenic – 12 mg/kg, dry weight;
  - PCP – 100 mg/kg, dry weight;
  - cPAHs – 2 mg/kg, dry weight;
  - Dioxins/furans – $8x10^{-5}$ mg/kg, dry weight; and
  - Protection of benthic organisms based on sediment bioassay tests, resulting in impaired survival and growth (i.e., weight).
- Prevent visible discharge of creosote to the Willamette River.
- Minimize releases of contaminants from sediment that might result in contamination of the Willamette River in excess of the following Federal and State ambient water quality criteria (AWQC)[1]:
  - Arsenic (III) – 190 micrograms per liter (µg/L);
  - Chromium (III) – 210 µg/L;
  - Copper – 12 µg/L;
  - Zinc – 110 µg/L;
  - PCP – 13 µg/L;
  - Acenaphthene – 520 µg/L;
  - Fluoranthene – 54 µg/L;
  - Naphthalene – 620 µg/L;
  - Total Carcinogenic PAHs – 0.031 µg/L; and
  - Dioxins/furans – $1x10^{-5}$ nanograms per liter (ng/L).
- Maintain the armoring layer to within 50 percent of the design specification:
  - 6-inch rock armoring – maintain thickness of at least 6 inches;

[1] One of the Remedial Action Objectives for groundwater in the ROD is to "prevent" groundwater discharges to the Willamette River that contain dissolved contaminants that would result in contaminant concentrations within the river in excess of background concentrations or in excess of water quality criteria for aquatic organisms. The 1996 AWQCs are listed as those were the criteria at the time of the ROD.

- 12-inch rock armoring – maintain thickness of at least 7.5 inches; and
- 24-inch rock armoring – maintain thickness of at least 12 inches.

- Maintain uniformity and continuity of articulated concrete block (ACB) armoring.
- Maintain at least 20 percent excess sorption capacity of the organoclay cap.

The AWQCs listed above are the surface water criteria in effect at the time of the ROD (EPA, 1996); however, since completion of the ROD, additional recommended EPA water quality criteria have been published. During meetings in August 2007 between stakeholders (DEQ, EPA, NOAA, Warm Springs Tribe, and Yakama Nation), it was agreed that for comparison purposes, five criteria would be included in analytical results summary tables in the 2008 O&M Report: (1) two AWQCs in effect at the time the ROD was issued (1996 criteria for chronic effects to aquatic life and for human health based on fish consumption); (2) two 2007 National Recommended Water Quality Criteria (NRWQCs) (one for chronic effects to aquatic life and one for human health [consumption of organisms]); and (3) current maximum contaminant levels (MCLs). In addition to these comparison criteria, revised DEQ AWQCs for human health were approved by EPA in October 2011. Although the comparison criteria and revised AWQCs are considered for reference, the 1996 AWQC values are the regulatory criteria for the Site until the ROD is amended.

Monitoring activities specified in the October 2007 *O&M Plan* for the sediment cap include visual inspections of near shore areas, multi-beam bathymetric surveys and side-scan sonar surveys of deeper areas, and diver inspections of areas of concern identified from the bathymetry and sonar surveys. Monitoring activities also include collection of samples from surface water, inter-armoring water, sub-armoring water, granular organophyllic clay cores, and crayfish. Organophyllic clay cores were collected in 2006, 2008, and 2009. Sediment cap water sample collection activities were complete in Spring 2010, and no samples were collected in 2011. The crayfish advisory for the Site was lifted in February 2010. It is recommended that sediment cap porewater and organophyllic clay cores be collected again in 2015 prior to the fourth 5-year review. Although the sediment cap is designed to be generally maintenance free, unplanned or non-routine maintenance may include: the replacement of warning buoys, placement of additional armoring due to erosion, and placement of additional organophyllic clay if unforeseen releases of creosote are discovered or if the existing organophyllic clay is not performing as designed. The planned frequency for these activities through September 30, 2016, is provided in Table 2.

2.3 Groundwater Remedy

The groundwater remedy consists of NAPL recovery, and a subsurface barrier wall surrounding approximately 18 acres within the upland soil cap. The barrier wall was completed in July 2004. Long-term monitoring is necessary because groundwater both within and outside of the subsurface barrier wall remains contaminated with metals, PCP, PAHs, dioxins, and NAPL. The performance standards for the subsurface barrier wall and NAPL recovery are as follows:

- Continue to recover NAPL from outside the subsurface barrier wall until recovery rates become minimal, alternative pumping strategies have been examined and/or field tested with poor results, and remaining NAPL does not pose a threat to the Willamette River and its sediments.
- Maintain contaminant concentrations in shallow, downgradient compliance wells (or sediment porewater) below Alternate Concentration Limits (ACLs) set forth in the ROD[2]:
  - Arsenic (III) – 1,000 µg/L;
  - Chromium (III) – 1,000 µg/L;
  - Copper – 1,000 µg/L;
  - Zinc – 1,000 µg/L;
  - PCP – 5,000 µg/L;
  - Total PAHs – 43,000 µg/L; and
  - Dioxins/furans – 0.2 ng/L.
- For reference purposes, groundwater data is compared with current MCLs as follows:
  - Arsenic – 0.01 milligrams per liter (mg/L);
  - Chromium – 0.1 mg/L;
  - Copper – 1.30 mg/L;
  - Zinc – 5.00 mg/L;
  - PCP – 1 µg/L; and

[2] The ROD initially specified site-specific ACLs for the Site. EPA has determined that ACLs are not valid as substitutes for Primary Drinking Water Standard MCLs in groundwater. Invalidation of ACLs also affects whether the groundwater RAOs derived from the provisions in Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for using ACLs remain valid for the Site. As a result of this determination, the DEQ and EPA anticipate that amended groundwater cleanup goals for the Site will be established in a ROD Amendment to be consistent with CERCLA and the NCP.

- Benz(a)pyrene – 0.2 µg/L.

- Minimize the transport of NAPL and communication of groundwater zones across the subsurface barrier wall.
- Minimize further vertical migration of creosote to the deep groundwater aquifer.
- Minimize visible discharge of creosote to the Willamette River.
- Maintain contaminant concentrations in the Willamette River below background concentrations or less than the Sediment Cap performance standards for surface water.

Monitoring activities for the groundwater remedy include groundwater elevation monitoring and groundwater sampling. Weekly NAPL recovery was conducted through April 2011. Additional discussion regarding future NAPL recovery is presented in Section 3.1. Routine maintenance of equipment and providing for Site utility service are also included as elements of groundwater O&M. The planned frequency for these O&M activities through September 30, 2016, is provided in Table 3.

3.0 OPERATION AND MAINTENANCE ACTIVITIES SUMMARY

Performance standards and activities conducted in 2011 are described below. More detailed presentations of the 2011 O&M activities are provided in the following appendices:

- Appendix A – Groundwater and NAPL Assessment
- Appendix B – Site Observation and Activity Summary
- Appendix C – Vegetation Management

3.1 DNAPL Data Gap Investigation

Since the installation of the barrier wall in 2003, dense non-aqueous phase liquid (DNAPL) has been regularly detected during weekly NAPL gauging and recovery events in three monitoring wells (MW-20i, MW-Ds, and MW-Gs) located outside the barrier wall in the Former Waste Disposal Area (FWDA). The bulk of the DNAPL recovered outside of the barrier wall was recovered from MW-20i.

In 2010, EPA and DEQ determined that a subsurface investigation in the vicinity of MW-20i was needed to support decisions to either install a more effective

recovery system or stop recovery altogether. The investigation was conducted in April 2011 to assess the nature, extent, source, and potential pathways of DNAPL to MW-20i, and included continuous sampling from borings to a depth of up to 110 feet below ground surface in 4 potential source locations. Based on the results of the investigation, and analysis of subsurface data from previous investigations, EPA and DEQ decided to suspend NAPL recovery from MW-20i, MW-Ds, and MW-Gs.

Four biweekly (May and June 2011) and four monthly (July through October) NAPL gauging events were then conducted to monitor NAPL recharge in the three wells. In August 2011, EPA and DEQ decided to permanently discontinue NAPL recovery at the Site considering the following:

- Four borings advanced outside the barrier wall in the FWDA in 2004 showed no evidence of mobile NAPL. Thin stringers of NAPL contaminated soils present as slight to moderate sheen and horizons with creosote odor were observed.
- Four borings advanced in the vicinity of MW-20i in April 2011 showed no evidence of mobile NAPL. Stained soils and creosote odors were present in limited horizons within the borings.
- Five years of semi-annual sediment cap sampling shows no evidence of creosote migrating to the Willamette River.
- Declining rates of NAPL recovery from MW-Gs and MW-Ds.
- NAPL recharge into MW-Ds, MW-Gs, and MW-20i, after NAPL extraction was suspended, stabilized at levels consistent with recent NAPL thicknesses, suggesting equilibrium with the surrounding residual NAPL in soil.

Since NAPL recovery was discontinued in late April 2011, NAPL thicknesses outside the barrier wall have been relatively stable and reflect the current 'steady-state' conditions. Although residual product exists outside the barrier wall in the FWDA, the extent of product appears to be confined to small localized stringers of NAPL in the vicinity of MW-20i. These dispersed sources of NAPL are not believed to be of significant quantity or mobility to threaten the Willamette River. Results of the investigation and conclusions are summarized in the report *DNAPL Data Gap Investigation,* included as Attachment A to Appendix A in this O&M Report (Hart Crowser/GSI, 2011).

3.2 NAPL Recovery and Thickness Assessment

Periodic well gauging, NAPL measurement, and NAPL extraction were performed to assess the performance of the barrier wall and soil cap in 2011. As previously discussed, NAPL recovery was conducted weekly in wells located outside the barrier wall in the FWDA and was also in one well inside the barrier wall until April 2011. NAPL gauging continued in the FWDA wells until October 2011. NAPL was also monitored during the semi-annual low-tide monitoring events in remaining site-wide wells, including 4 wells in Willamette Cove in June and October 2011.

During 2011, NAPL was measured in five (EW-1s, EW-10s, MW-20i, MW-Ds, and MW-Gs) of the nine wells gauged weekly, and in seven (EW-8s, EW-9s, EW-15s, EW-18s, EW-23s, MW-22i, and MW-56s) of the site wells gauged semi-annually. Prior to terminating NAPL recovery on April 20, 2011, DNAPL was extracted from exterior wells MW-20i, MW-Ds, and MW-Gs, and interior well EW-1s. Light non-aqueous phase liquid (LNAPL) was not recovered from any wells at the Site in 2011.

Approximately 6,550 gallons of NAPL have been extracted from site wells to date. Approximately 42 gallons of NAPL were extracted from the Site between January 3 and April 20, 2011. Approximately 17 gallons (40%) were recovered from EW-1s inside the barrier wall and approximately 25 gallons of NAPL were recovered from three wells outside the barrier wall (roughly 7 gallons per month). The bulk of DNAPL recovered outside the barrier wall was from MW-20i. Relatively small amounts of DNAPL were recovered from MW-Ds and MW-Gs.

3.3 Groundwater Flow Direction and Gradient Assessment

Manual measurements of static groundwater levels were conducted during low-tide on June 15 and October 25, 2011. Shallow groundwater elevations and gradients collected during these reporting periods are fairly consistent with conditions observed during the same reporting periods in 2010. In general, horizontal gradients are the greatest during periods of high precipitation and decrease during periods of low precipitation. Groundwater flow inside the barrier wall remains relatively flat, while outside the wall, shallow groundwater flow is diverted around the barrier wall to the northwest and south. When the Willamette River reaches peak stage (greater than about 12 ft North American Vertical Datum of 1988 [NAVD88]), which typically occurs in June each year, it can induce a partial reversal of gradient within the northwest corner of the barrier wall. Given the higher than average water levels in the Willamette River in June 2011 (up to 22 ft NAVD88), this reversal in gradient was more pronounced than

the last several years, and a north-easterly gradient was noted both inside and outside of the barrier wall.

The 2011 groundwater data continues to demonstrate that shallow groundwater within the barrier is isolated from groundwater outside the barrier wall based on the independent groundwater elevations, flow directions, and gradients. Precipitation can only enter inside the barrier wall through the riparian area, and also between the connection of the Resource Conservation and Recovery Act (RCRA) cap and the top of the barrier wall. A decrease in water levels inside the barrier wall since 2005 suggests that there is a hydraulic connection with groundwater outside the riverward portion of barrier wall. The shallow water bearing zone inside the barrier wall has reached equilibrium with the river and minimal net groundwater migration is expected from within the barrier wall or into the barrier wall. In 2011, after the high river stages, the groundwater elevation within the barrier wall increased. It will likely take a few years for the shallow groundwater elevation to re-equilibrate with the Willamette River, assuming river elevations return to a normal yearly pattern.

Groundwater elevation data was also collected from selected monitoring wells surrounding the barrier wall using pressure transducers to monitor groundwater level fluctuations on a half-hour basis. Hydrographs were prepared for monitoring well clusters MW-36/37, MW-44/45, and MW-52/53 inside and outside the barrier wall to document groundwater elevation level differences and assess barrier wall performance. The hydrographs illustrate a net vertical gradient between the shallow and intermediate and deep water-bearing zones, which continues to be slightly downward, similar to the vertical gradients measured in 2008 through 2010.

The transducer data from two interior shallow wells (EW-1s and MW-15s) show that groundwater elevations in these wells are more comparable to interior well MW-52s located on the upgradient (bluff) side of the barrier wall than interior well MW-36s on the downgradient side in the eastern corner. This indicates a confining silt layer is present in the vicinity of EW-1s and MW-15s by showing a muted response to groundwater conditions outside of the barrier wall.

Based on the evaluation of groundwater data from 2005 through 2011, the barrier wall and impermeable soil cap are functioning as designed to divert groundwater flow around and prevent rainwater infiltration into NAPL source areas contained within the barrier wall. NAPL accumulation does not appear to be increasing in any of the monitoring wells inside or outside the barrier wall.

3.4 Site Observation and Activity Summary

Tables 1 and 2 outline the planned inspections for the soil and sediment caps, respectively, through September 2016. Hart Crowser subcontracted with Clearwater to perform routine O&M services through June 2011. Reduced O&M activities were completed by Hart Crowser from July through December 2011, following the termination of NAPL recovery by DEQ and EPA. Soil and sediment cap inspections were conducted four times in 2011. The inspections were conducted in conjunction with three quarterly Site meetings and the annual project team meeting in August.

Shoreline sheen was observed in several locations during the August inspection, and was only observed along the shoreline at the southern end of the Site in October 2011. These sheens were consistent with those periodically observed along the shoreline in late summer and fall in past years. Results of extensive study conducted from 2007 through 2009 conclude that the sheen is not related to Site contaminants migrating through the sediment cap. A detailed discussion of the Site sheen's nature, origin, and extent are included in the *January 2009 through December 2009 O&M Report Appendix F* (Hart Crowser/GSI, 2010b).

Moderate erosion of soil mulch and vegetation cover on the green turf reinforced matting (TRM) was observed in October along the lower riparian area where the TRM is attached to the ACB. However, vegetative cover does not appear to be eroded at elevations above the ACB. This erosion is the result of the high Willamette River levels (up to 22 ft NAVD88) in June 2011. Sand covers the ACB over much of the shoreline but the ACB is exposed where the bank slope is steeper and in Willamette Cove. The general public uses the shoreline for recreation, most commonly walking dogs. Additional gravel is recommended to cover the ACB along the steeper portions of the shoreline to create a more stable substrate for wildlife and for a consistent and safer walking surface for public use.

Significant amounts of large woody debris, consistent with previous years, remain along the length of the shoreline and help create wildlife habitat. Wildlife commonly seen at the Site includes Canada geese, blue herons, ospreys, crawfish, squirrels, and rabbits; evidence of coyotes has also been observed. Minor instances of vandalism and littering have occurred outside the fenced perimeter of the Site. During the December 2011 site inspection, a section of the eastern perimeter fence had apparently been cut open allowing trespassers to enter the Site and damage one sign. The fence was repaired the following week and remains secure. The degree of upland soil cap subsidence (along with associated groundwater temperatures) has decreased significantly in the localized area near EW-1s, compared to the subsidence measured in that area in 2008 and

2009. The impermeable cap stormwater drainage system appears to be unaffected for the subsidence and continues to operate effectively.

On August 12, 2011, five permanent buoys were installed by Northwest Underwater Construction, under subcontract to Hart Crowser, marking the outer boundary of the sediment cap to warn of potential underwater hazards.

3.5 Vegetation Management

The Site was planted and an irrigation system was installed by City of Portland Bureau of Environmental Services (BES) in February 2006. Through an Intergovernmental Agreement (IGA) with the DEQ, BES provided vegetation management services at the Site from 2006 through 2010. Now that the vegetation on the soil cap is fully established and the irrigation system is no longer needed, BES no longer manages vegetation at the site.
The potential for noxious weeds problems remains high for the entire Site. Adjacent, off-site areas also have severe noxious weed problems, including Scotch broom on the Burlington Northern Railroad grade and butterfly bush from the Triangle Park industrial property. Native Ecosystems Northwest, under subcontract to Hart Crowser, completed semi-annual noxious weed control activities in Spring and Fall 2011.

A baseline reconnaissance site visit was conducted on June 10, 2011, by a Hart Crowser ecologist to confirm the vegetation conditions discussed in the final 2010 BES report. The baseline inspection included visual observation of vegetation planting areas, species identification (native, non-native, and invasive), growth, density, and general coverage throughout the Site. In general, the upland and Riparian components were observed to be performing well with the installed trees and shrubs looking healthy and spreading. Groundcover species provided excellent coverage of the ground with the exception of a few areas containing bare ground and the relatively bare understory in the pond area. Limited quantities of noxious weeds were observed in the Upland area and were primarily limited to the southwestern edge of the impermeable cap. A follow-up inspection of the vegetation conditions was conducted on September 8, 2011. The Hart Crowser ecologist determined that the tree, shrub, and groundcover plantings continue to perform well throughout the site.

Continued monitoring of vegetation stability will be assessed site-wide, and impaired vegetation will be replaced in general accordance with the BES IGA, and the National Marine Fisheries Services Biological Opinion for the Site (NOAA, 2004). A revised Vegetation Management Plan for reduced long-term

monitoring will be included in the revised O&M Plan. Decommissioning of the irrigation system is scheduled for 2012.

3.6 Sampling Requirements

No groundwater, surface water, inter-armoring water, or sub-armoring water quality samples were conducted in 2011. As outlined in Tables 2 and 3, the next water quality sampling event is planned for the Spring of 2015.

4.0 SUMMARY OF PLANNED ACTIVITIES FOR 2012

Table 4 summarizes the planned O&M activities for 2012. Tasks correspond to O&M activities outlined in Tables 1, 2, and 3. The frequency and scope of activities conducted in previous years have been reduced or are planned to be reduced in 2012. Soil and sediment cap inspections will be conducted quarterly, and Site vegetation inspections and groundwater elevation monitoring will occur semi-annually over the next 5 years. Sediment cap sampling will only be conducted once every five years, beginning in Spring 2015.

5.0 REFERENCES

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NOAA, 2004. *Endangered Species Act – Section 7 Consultation Biological Opinion & Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation, McCormick & Baxter Creosoting Company Site, Willamette River Remediation Sediment Cap, Multnomah County, Oregon.* March 15, 2004.

Table 1: Soil Cap O&M Activities through September 30, 2016
McCormick and Baxter Superfund Site
Portland, Oregon

O&M Activity	Frequency
Visual Inspections:	
Cap surface	Quarterly
Subsidence near EW-1s	Quarterly
Stormwater conveyance system	Quarterly
Security fencing	Quarterly
Warning signs	Quarterly
Abundance and survival of vegetation	Quarterly
Routine Maintenance and Monitoring:	
Manual removal of invasive plant	Semiannually, if necessary
Targeted application of herbicides	Semiannually, if necessary
Non-Routine Maintenance – such as:	
Repairs of fence	As needed
Replacement of warning signs	As needed
Repairs of gravel roads	As needed
Filling of potential animal burrow into the earthen cap	As needed
Remove sediments from manholes	As needed
Replanting unsuccessful trees and shrubs	As needed

Table 2: Sediment Cap O&M Activities through September 30, 2016
McCormick and Baxter Superfund Site
Portland, Oregon

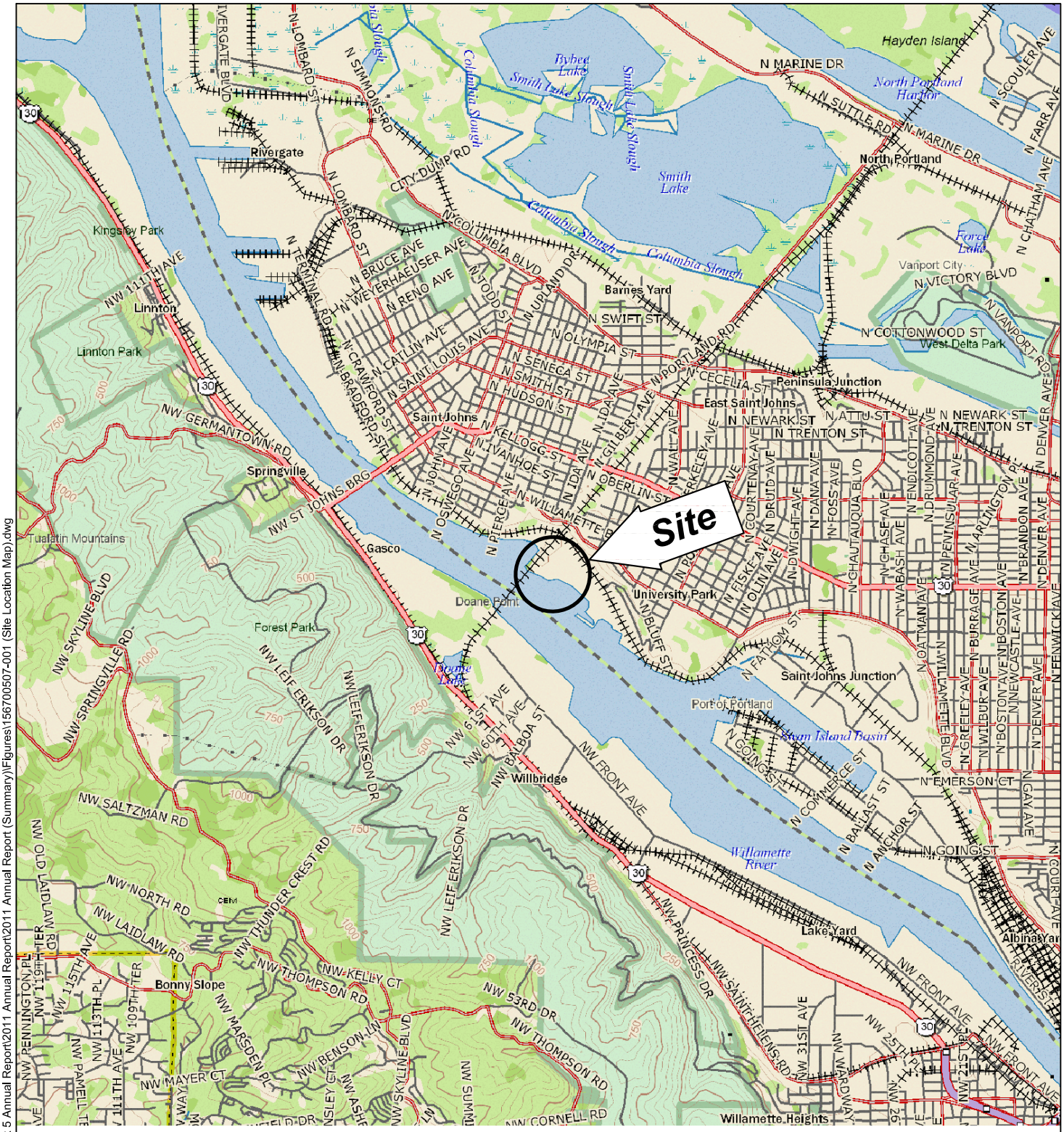
O&M Activity	Frequency
Visual Inspections (from shore):	
Warning buoys	Quarterly
Cap surface	Quarterly
Habitat quality	Annually
Routine Monitoring:	
Porewater Sampling	Every 5 years (starting in 2015)
Organoclay cores or SPME samples	In 2015, then determine frequency
Non-Routine Monitoring – such as:	
Multibeam bathymetric surveys, side-scan sonar survey	Review as available by third parties, perform as needed (flood event)
Aerial photography of shallow water area, shoreline, and riparian zone	Review as available by third parties
Diver Inspection	As needed, dependent on bathymetry or other lines of evidence
Non-Routine Maintenance – such as:	
Replacement of buoys	As needed
Additional armoring placement	As needed
Additional organoclay capping	As needed
ACB grouting	Every 5 years , or as needed based on site inspections

Table 3: Groundwater O&M Activities through September 30, 2016
McCormick and Baxter Superfund Site
Portland, Oregon

O&M Activity	Frequency
NAPL Monitoring:	
Manual gauging of Site wells	Semiannually
Manual extraction from exterior wells	Not recommended
Groundwater Monitoring:	
Downloading continuous water level data from transducers	Semiannually
Manual water level measurements from Site wells	Semiannually
Groundwater Sampling:	
Site-wide	Every 5 years (starting in 2015)
Infiltration pond (MW-59s)	Every 5 years (starting in 2015)
Routine Maintenance of Equipment:	
Interface probes, pumps, vehicle, data loggers/transducers, etc.	As needed
Utilities Service:	
Water, electric, phone, alarm, solid waste, toilet	Continuous

Table 4: Scheduled O&M Activities for January 2012 through December 2012
McCormick and Baxter Superfund Site
Portland, Oregon

O&M Activity	Frequency
Soil Cap	
Visual Inspections:	
Cap surface	Quarterly
Subsidence near EW-1s	Quarterly
Stormwater conveyance system	Quarterly
Security fencing	Quarterly
Warning signs	Quarterly
Abundance and survival of vegetation	Quarterly
Routine Maintenance and Monitoring:	
Manual removal of invasive plant	Semiannually, if necessary
Targeted application of herbicides	Semiannually, if necessary
Non-Routine Maintenance	As needed
Sediment Cap	
Visual Inspections (from shore):	
Warning buoys	Quarterly
Cap surface	Quarterly
Habitat quality	Annually
Non-Routine Maintenance & Monitoring	As needed
Groundwater	
NAPL Monitoring:	
Manual gauging of Site wells	Semiannually
Groundwater Monitoring:	
Downloading continuous water level data from transducers	Semiannually
Manual water level measurements from Site wells	Semiannually
Routine Maintenance of Equipment	As needed
Utilities Service	Continuous, until decomissioned



0 4,000 8,000

Scale in Feet

N

Source: DeLorme Topo USA.

McCormick and Baxter Superfund Site
6900 N Edgewater Street, Portland, Oregon

Site Location Map

5/12

HARTCROWSER

GSI Water Solutions, Inc.

Figure

1

F:\Data\Jobs\DEQ\15670-xx M&B\15670-06 New New O&F\Tk 5 Annual Report\2011 Annual Report\2011 Annual Report (Summary)\Figures\1567005 07-001 (Site Location Map).dwg

LEGEND

- Subsurface Barrier Wall
- Sediment Cap Boundary
- Granular Organophilic Clay
- Organoclay™ Reactive Core Mats (Double)
- Organoclay™ Reactive Core Mats (Single)
- Thickened Sand Layer
- Boulder Clusters
- Riprap Armor
- Articulated Concrete Block
- 6-inch Minus Rock Armor
- 10-inch Minus Rock Armor
- Impermeable Cap
- Earthen Soil Cap Boundary

NOTE: Aerial photo taken on September 22, 2006

0 250 500

Scale in feet

McCormick & Baxter Superfund Site
Portland, Oregon

Current Site Layout and Features

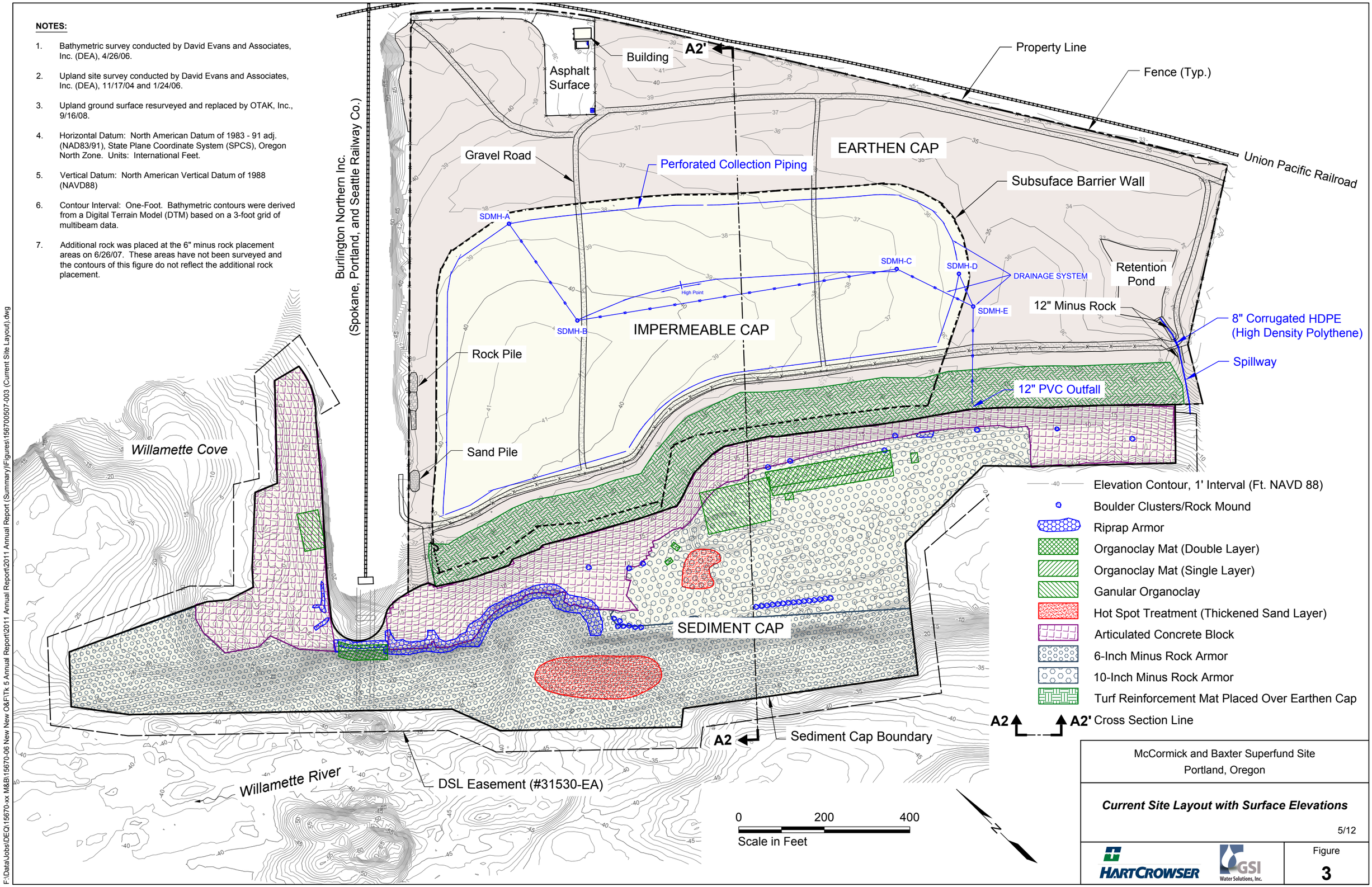
5/12

HARTCROWSER GSI Water Solutions, Inc.

Figure
2

NOTES:

1. Bathymetric survey conducted by David Evans and Associates, Inc. (DEA), 4/26/06.
2. Upland site survey conducted by David Evans and Associates, Inc. (DEA), 11/17/04 and 1/24/06.
3. Upland ground surface resurveyed and replaced by OTAK, Inc., 9/16/08.
4. Horizontal Datum: North American Datum of 1983 - 91 adj. (NAD83/91), State Plane Coordinate System (SPCS), Oregon North Zone. Units: International Feet.
5. Vertical Datum: North American Vertical Datum of 1988 (NAVD88)
6. Contour Interval: One-Foot. Bathymetric contours were derived from a Digital Terrain Model (DTM) based on a 3-foot grid of multibeam data.
7. Additional rock was placed at the 6" minus rock placement areas on 6/26/07. These areas have not been surveyed and the contours of this figure do not reflect the additional rock placement.



McCormick and Baxter Superfund Site
Portland, Oregon

Current Site Layout with Surface Elevations

5/12

HARTCROWSER

GSI Water Solutions, Inc.

Figure
3

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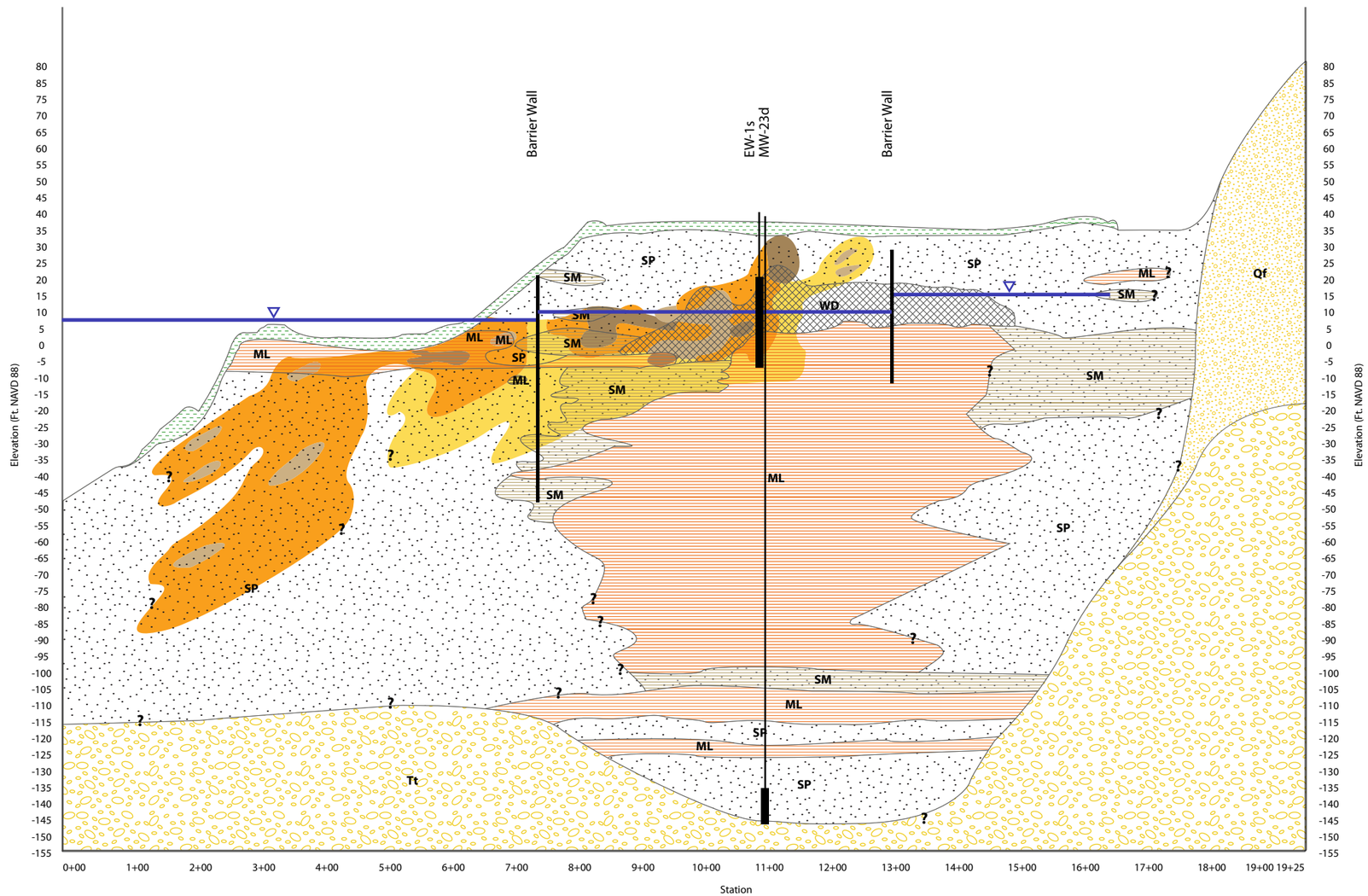


LEGEND

- SP- Sand, Fine to Medium, Poorly Graded
- SM- Silt Sand, or Thin Interbeds of Silt and Sand
- ML- Clayey Silt or Silty Clay
- WD- Wood Debris, Chips or Sawdust Occasionally
- Qf- Catastrophic Flood Deposits Consisteing of Gravels and Sands
- Tt-Troutdale Formation
- Sediment/Soil Cap
- Approximate Average Water Level 2008
- Creosote Odor
- Strong Creosote Odor
- Heavy Sheen
- Saturated

Horizontal Scale in Feet
0 200 400
0 40 80
Vertical Scale in Feet
Vertical Exaggeration = 5x

McCormick and Baxter Superfund Site
Portland, Oregon

Historical NAPL Distribution Cross Section

5 12

HARTCROWSER

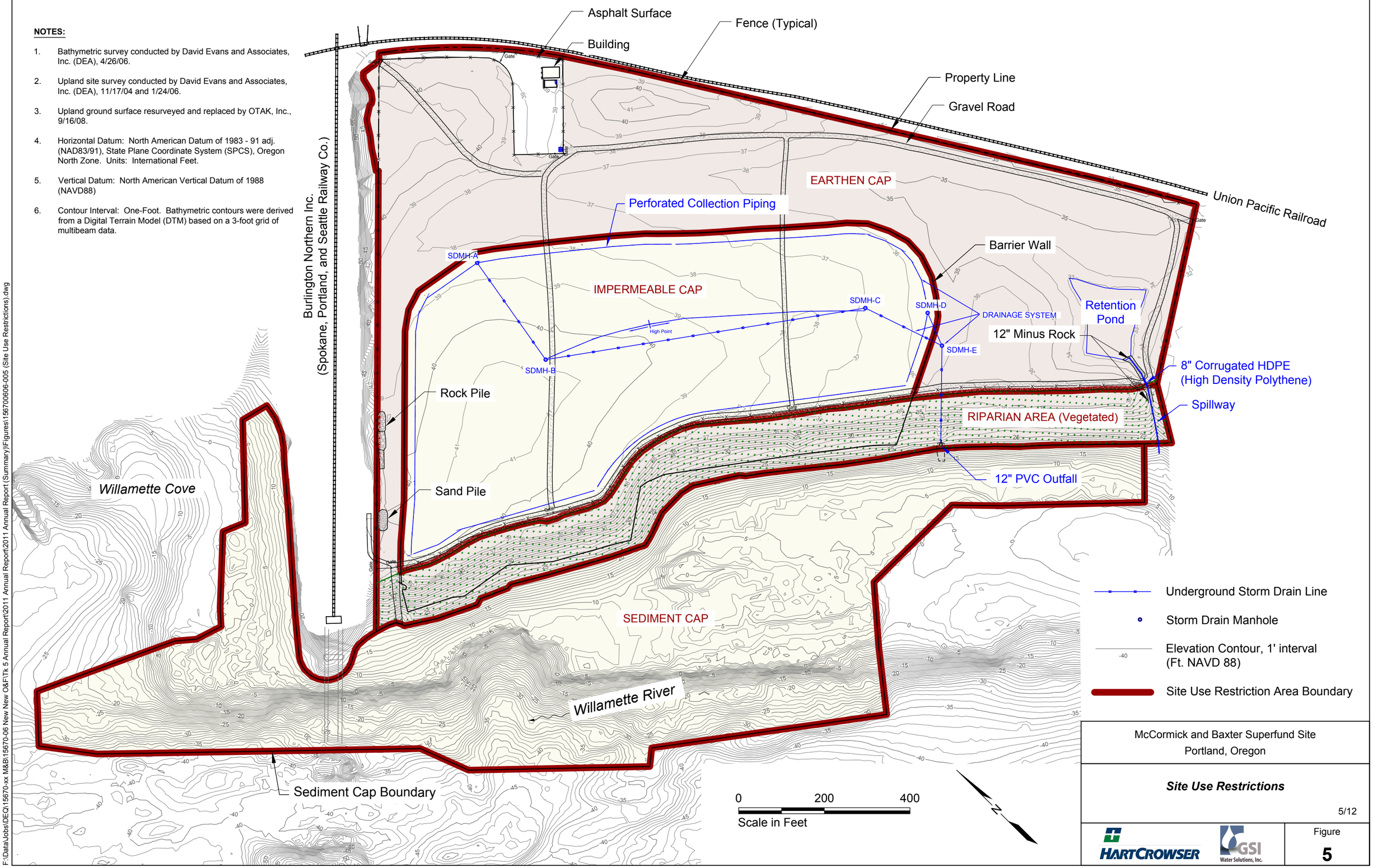
GSI Water Solutions, Inc.

Figure
4

W:\Projects\205 - OR DEQ\003 - 003 McCormick and Baxter\Figures

NOTES:

1. Bathymetric survey conducted by David Evans and Associates, Inc. (DEA), 4/26/06.
2. Upland site survey conducted by David Evans and Associates, Inc. (DEA), 11/17/04 and 1/24/06.
3. Upland ground surface resurveyed and replaced by OTAK, Inc., 9/16/08.
4. Horizontal Datum: North American Datum of 1983 - 91 adj. (NAD83/91), State Plane Coordinate System (SPCS), Oregon North Zone. Units: International Feet.
5. Vertical Datum: North American Vertical Datum of 1988 (NAVD88)
6. Contour Interval: One-Foot. Bathymetric contours were derived from a Digital Terrain Model (DTM) based on a 3-foot grid of multibeam data.



McCormick and Baxter Superfund Site
Portland, Oregon

Site Use Restrictions

5/12

HARTCROWSER

GSI Water Solutions, Inc.

Figure
5

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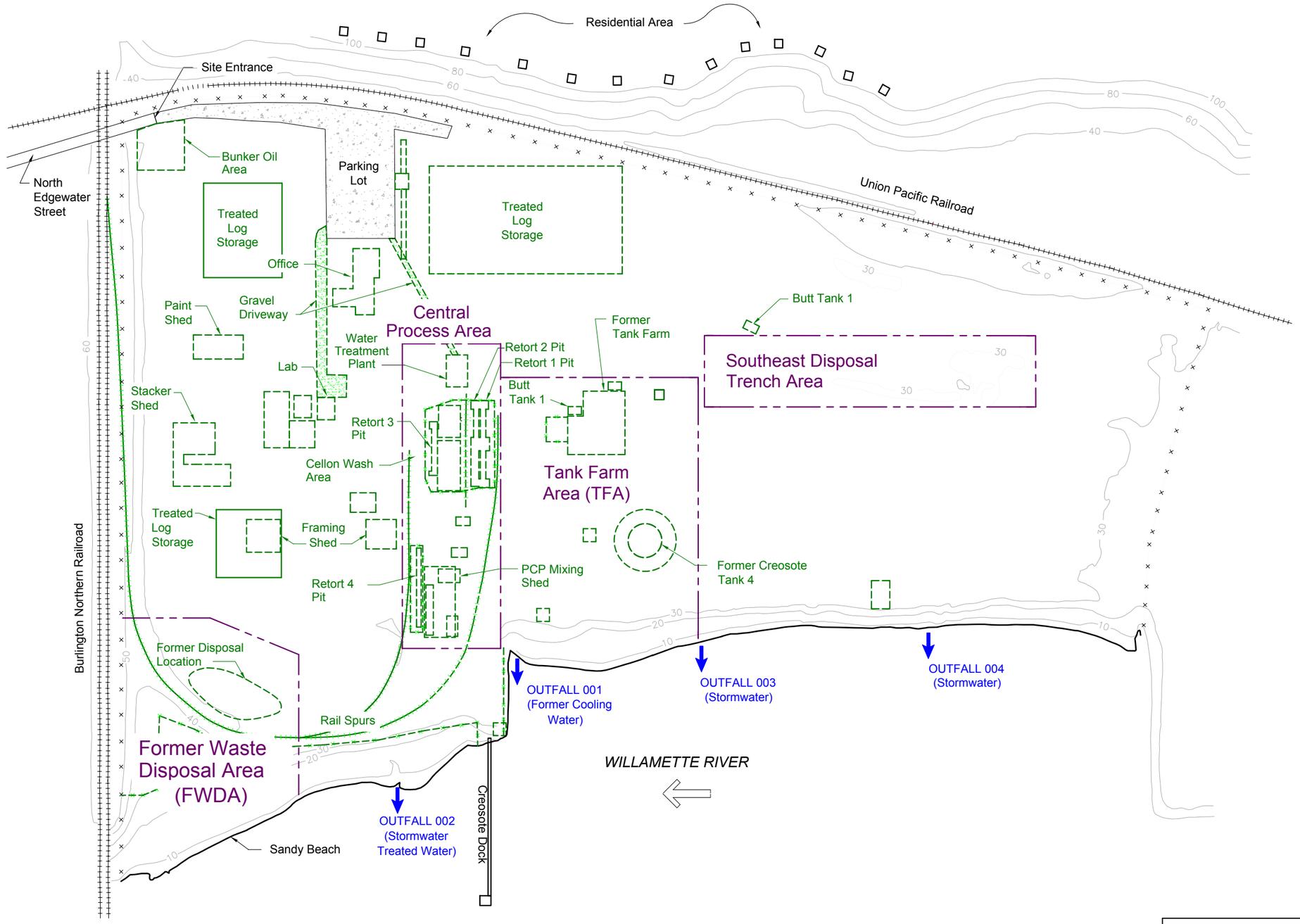

McCormick and Baxter Superfund Site
Portland, Oregon

Historic Contaminant Source Areas

5/12

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Figure
6

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APPENDIX A
GROUNDWATER AND NAPL MONITORING

OPERATION AND MAINTENANCE REPORT
JANUARY 2011 THROUGH DECEMBER 2011

Hart Crowser/GSI
15670-06/Task 5 May 23, 2012

APPENDIX A
CONTENTS

TABLES

APPENDIX A
CONTENTS (CONTINUED)

FIGURES

ATTACHMENTS

ACRONYMS

DEQ	Oregon Department of Environmental Quality
DNAPL	dense non-aqueous phase liquid
E&E	Ecology and Environment, Inc.
EPA	Environmental Protection Agency
ft/ft	feet per foot
FWDA	Former Waste Disposal Area
IDW	investigation-derived waste
LNAPL	light non-aqueous phase liquid
NAPL	non-aqueous phase liquid
NAVD	North American Vertical Datum
O&M	Operation and Maintenance
RCRA	Resource Conservation and Recovery Act
RM	Willamette River Mile
Site	McCormick and Baxter Superfund Site
TFA	Tank Farm Area
USGS	U.S. Geological Survey

APPENDIX A
GROUNDWATER AND NAPL MONITORING
OPERATION AND MAINTENANCE REPORT
JANUARY 2011 THROUGH DECEMBER 2011
MCCORMICK AND BAXTER SUPERFUND SITE

1.0 INTRODUCTION

Appendix A to the *January 2011 through December 2011 Operation and Maintenance (O&M) Report* (O&M Report) presents the non-aqueous phase liquid (NAPL) measurement and extraction results and groundwater elevation and gradient information collected at the McCormick and Baxter Superfund Site (Site) in 2011. In addition to the routine monitoring and NAPL recovery activities, the subsurface surrounding MW-20i was investigated in Spring 2011 to determine whether ongoing NAPL recovery outside the barrier wall is warranted. Results of the investigation and conclusions are summarized in the report *DNAPL Data Gap Investigation,* included as Attachment A to this Appendix. The location of the Site, Site layout, and surface elevations are presented on Figures 1 through 3 in the O&M Report.

2.0 NAPL MEASUREMENTS AND EXTRACTION

NAPL monitoring at the Site is used to evaluate the functional performance of the barrier wall and soil cap, and to document NAPL removal relative to the groundwater remedial action objective: to contain the NAPL plumes, prevent ongoing discharges of NAPL to the Willamette River, and minimize further contamination of the intermediate and deep aquifers.

2.1 Field Activities

Between January 1, 2011, and April 20, 2011, NAPL gauging and recovery was conducted weekly at nine monitoring well locations: EW-2s, EW-9s, EW-10s, EW-19s, MW-20i, MW-34i, MW-Ds, MW-Gs, and EW-1s. The majority of NAPL was recovered from MW-20i, located in the Former Waste Disposal Area (FWDA) outside of the barrier wall.

NAPL presence and thickness were measured from 74 onsite wells and 5 offsite wells (Willamette Cove) as part of conducting the site-wide, low-tide semi-annual

monitoring events on June 10 and October 25, 2011. Figure A-1 shows all monitoring well locations.

NAPL was detected in five (EW-1s, EW-10s, MW-20i, MW-Ds, and MW-Gs) of the nine wells gauged weekly, and in seven (EW-8s, EW-9s, EW-15s, EW-18s, EW-23s, MW-22i, and MW-56s) other Site wells gauged semiannually. Figures A-2 and A-3 show the locations of wells that contained measureable quantities of light non-aqueous phase liquid (LNAPL) and/or dense non-aqueous phase liquid (DNAPL) for the June and October monitoring events, respectively. Tables A-1 and A-2 provide semiannual NAPL gauging measurements. Figures A-4 through A-15 show the NAPL and groundwater elevations versus time in individual wells that routinely contain NAPL. The screened interval elevations and the well depth are also shown. The thickness of LNAPL can be calculated by subtracting the LNAPL elevation (when LNAPL is present) from the groundwater elevation. Similarly, the DNAPL thickness is represented by the difference between the DNAPL elevation and the well depth elevation.

During the weekly NAPL gauging events, which were conducted through April 20, 2011, NAPL was recovered from individual wells meeting the following NAPL extraction criteria:

- Minimum of 0.4 ft (foot) thickness of LNAPL;
- Minimum of 1.5 ft (feet) thickness of DNAPL; and
- The well is located outside the barrier wall (with the exception of EW-1s).

LNAPL is extracted using a bailer, and DNAPL is extracted using a submersible pump in accordance with the *Operation and Maintenance Manual* (Hart Crowser/GSI, 2010). Table A-3 lists the weekly NAPL thickness measurements and the estimated extraction volumes, including water and NAPL (based on estimated volume in a 5-gallon bucket), for wells meeting the extraction criteria from January 1 through April 20, 2011. NAPL thickness measurements for subsequent biweekly and monthly gauging events are provided in Table A-4.

2.2 LNAPL Observations

Outside the Barrier Wall. The only location where LNAPL was consistently measured outside the barrier wall was in EW-10s. Up to 1.5 ft of product measured in EW-10s in 2011. Historically, LNAPL in this well consisted of speck-sized globules dispersed throughout the top of the water column rather than a discrete layer of product, and therefore, the measurements likely overestimate the amount of product present. Because this well is in close proximity to the

Willamette River, future periodic gauging should be conducted to monitor potential changes in the historic nature of LNAPL at this location.

The NAPL and groundwater elevations measured in EW-10s since 1999 are shown on Figure A-4. The red line denotes the date at which NAPL recovery was discontinued, April 21, 2011. The slight increase in LNAPL thickness observed between mid-July and October 2011 is associated with a decrease in groundwater elevation and is consistent with LNAPL thicknesses observed during historic declines in groundwater elevation.

During the October 25, 2011 semiannual monitoring event, 0.5 ft of LNAPL was observed in monitoring well MW-20i (Figure A-5). Since the screened interval in MW-20i is located below the water table, it is physically impossible for LNAPL at this elevation to flow into the well. However, historic specific gravity measurements of NAPL in MW-20i approximate the specific gravity of water so it is reasonable to conclude that this product separates into LNAPL and DNAPL within the well. LNAPL was also observed in MW-20i in 2002, as shown on Figure A-5a.

Based on observation and monitoring in 2011, the nature and extent of LNAPL outside the barrier wall appears to be stable, with no evidence of mobility either across the barrier wall or to the Willamette River.

Inside the Barrier Wall. During the semiannual monitoring events conducted in 2011, measurable LNAPL was observed in the following wells within the barrier wall: EW-15s (1.1 ft and 7.1 ft), EW-23s (trace and 4.5 ft), and MW-56s (zero and 0.8 ft). Figures A-6 through A-8 show the elevations of LNAPL and shallow groundwater in these wells versus time. LNAPL thickness within the barrier wall is generally greater when the groundwater elevation is low. This is the result of gravity drainage of LNAPL within the vadose zone when the water table drops which results in LNAPL pooling on the water surface. This pattern is consistent from mid-2006 through the end of 2010 because LNAPL was not recovered inside of the barrier wall in this time-frame (i.e., LNAPL thickness was not disturbed by recovery). Although the LNAPL thickness varies cyclically with changes in the groundwater elevation, the overall LNAPL thickness in these wells is consistent and stable over time.

2.3 DNAPL Observations

Outside the Barrier Wall. Consistent with previous years, DNAPL was regularly detected during routine gauging of three FWDA wells, MW-20i, MW-Ds, and MW-Gs, located outside the barrier wall as shown on Figures A-5, A-9, and A-10,

respectively. During the weekly gauging and recovery events in 2011 (January 1 to April 20, 2011), measured DNAPL thickness ranged from a minimum of zero ft (not detected) in well MW-Gs to 6.4 ft in well MW-20i. In 2011, extraction criteria for DNAPL were met 100 percent of the time for well MW-20i, 69 percent for well MW-Ds, and 25 percent for well MW-Gs. When manual extraction is performed, well MW-20i recovered sufficiently on a weekly basis, while wells MW-Ds and MW-Gs occasionally took two or more weeks for the DNAPL to recover to the extraction criteria thickness.

Figures A-5b, A-9b, and A-10b provide the groundwater and NAPL elevation measurements through April 20, 2011, for MW-20i, MW-Ds, and MW-Gs, respectively. As shown in Figure A-5b, DNAPL thickness in MW-20i initially increased to 6.5 ft following the last recovery event, then decreased to 4.0 ft. The increase in DNAPL thickness appears to be associated with the rise in shallow groundwater elevation. Figure A-9b illustrates that the weekly NAPL extraction had the effect of maintaining a DNAPL thickness of approximately 2 ft or less in MW-Ds since completion of the barrier wall in June 2003. Post NAPL extraction, DNAPL thicknesses in MW-Ds increased to approximately 2.3 ft, which is consistent with DNAPL recovery thicknesses during the period when DNAPL extraction was ongoing. After recovery from MW-Ds was discontinued, the rise in groundwater elevation did not visibly affect the DNAPL thickness in this well, as was observed in MW-20i.

Figure A-10b shows the DNAPL thickness in MW-Gs increased, after extraction was discontinued, and coincidentally with the rise in groundwater elevation, similar to what was observed in MW-20i. These post extraction DNAPL thicknesses are consistent with the historic NAPL thickness behavior in MW-Gs prior to discontinuing NAPL extraction.

DNAPL was present in the sump in well EW-9s until March 2008 but was not observed through the remainder of the extraction period (Figure A-11). Following the DNAPL Data Gap Investigation and discontinuation of NAPL extraction outside the barrier wall, DNAPL (<1 ft thick) reappeared in the sump of EW-9s. Subsurface disturbance associated with the DNAPL Data Gap Investigation may have locally mobilized small quantities of DNAPL, causing it to re-enter this well sump. However, since the observed thickness is not increasing and remains below the bottom of the well screen, significant NAPL migration is not expected from this location.

No NAPL was observed in MW-34i, EW-19s, MW-60d, or the MW-58 or MW-37 well clusters. This is consistent with historic observations and supports the notion that DNAPL observed in the FWDA is localized and stable. Based on

observation and monitoring in 2011, the nature and extent of DNAPL outside the barrier wall appears to be stable, with no evidence of mobility either across the barrier wall or to the Willamette River.

Inside the Barrier Wall. DNAPL was detected during the 2011 semiannual monitoring events within the barrier wall near the former Tank Farm Area (TFA) in wells EW-1s, MW-22i, and EW-8s, and EW-18s as shown on Figures A-12 through A-15.

Although DNAPL was observed in EW-1s after construction of the barrier wall in September 2003, the volume of DNAPL decreased such that it was no longer observed in this well by January 2006. After several years with no observed product, DNAPL was noticed in this well during the quarterly monitoring event on March 13, 2009. As mentioned in previous reports, DNAPL extraction from this well was initiated to reduce the potential for vertical mobility due to decreased NAPL viscosity caused by high subterraneous temperatures in this area. Figure A-12 shows the DNAPL and groundwater elevations since extraction began on July 6, 2009, to present. After extraction was discontinued in April 2011, DNAPL thickness initially increased, then stabilized at a thickness of approximately 6 ft. The water temperature in this well has steadily decreased since the well was sealed to prevent oxygen from reaching the unsaturated zone and feeding aerobic degradation. This is further discussed in Section 3.1 of this Appendix.

Figure A-13 shows the DNAPL thickness versus time for MW-22i. DNAPL was measured in well MW-22i at 7.8 ft and 6.5 ft during the June and October semiannual monitoring events, respectively. With one exception, DNAPL has been detected each quarter in MW-22i since the beginning of 2007. DNAPL was also consistently reported in MW-22i from 1997 to 2000. During monitoring in July 2007, a bailer was utilized to extract liquid from the well because of a petroleum hydrocarbon (not creosote) odor within the well. The extracted liquid contained speck-sized globules of DNAPL with no distinct DNAPL layer. Because the thickness of DNAPL in MW-22i was consistently measured at thicknesses greater than 5 ft, recovery was attempted again in 2008. Approximately five gallons of liquid was bailed from the bottom of the well and allowed to settle. After settling, the liquid was observed to be primarily water with limited speck-sized DNAPL globules, rather than a distinct layer of DNAPL. Therefore, it is reasonable to conclude that the observations and monitoring conducted since 2007 do not accurately reflect the volume of DNAPL in the well. Because MW-22i is within the barrier wall, no further extractions have been conducted.

Figure A-14 presents the DNAPL thickness versus time for EW-8s. The DNAPL thickness in EW-8s was recorded at 13.2 ft and 2.0 ft during the June and October 2010 semiannual monitoring events, respectively. The DNAPL thickness varies directly with the shallow groundwater elevation. Increases in the groundwater elevation may locally mobilize DNAPL. The pattern of DNAPL thickness in EW-8s has been consistent over the past 4 years during the period where DNAPL extraction was not occurring inside the barrier wall.

2.4 NAPL Extraction Summary

LNAPL was not recovered from any wells at the Site in 2011. Although the thickness of LNAPL varies seasonally with groundwater elevation, the accumulated volume does not appear to be increasing, either inside or outside the barrier wall.

Based on periodic investigation-derived waste (IDW) drum measurements of extracted liquid (water and NAPL), approximately 42 gallons of DNAPL were extracted from the Site between January 3 and April 20, 2011, of which approximately 40% (17 gallons) were from EW-1s inside the barrier wall. This calculation assumes that the extracted liquid contains 38% water and 62% NAPL. These percentages were based on percent present as water and NAPL after freezing NAPL/water mixtures removed from wells. Freezing was performed twice in 2007 and is reported in two technical memoranda presented in Appendix A of the *Operation and Maintenance Report January 2007 through December 2007* (Ecology and Environment, Inc. [E&E], 2008). The extraction volumes determined in this manner do not always correspond to the extraction volumes estimated during the weekly NAPL gauging and recovery events. During the weekly events, the quantity of extracted liquid (water + NAPL) from each well is estimated by noting the amount of liquid in a 5-gallon bucket. These measurements are coarse approximations and tend to overestimate the amount of extracted liquid in comparison with the direct IDW drum measurements. Extraction volumes based on IDW drum measurements are thought to be more representative of actual extraction volumes than the weekly extraction estimates and are thus used to quantify the extraction volumes.

Historical cumulative NAPL extraction (based on drum gauging) is presented in Table A-5, and shown graphically on Figure A-16. Between February 1993 and April 20, 2011, approximately 6,550 gallons of NAPL have been extracted from Site wells. Based on the weekly NAPL recovery measurements, approximately 40% of the 2011 extraction volume can be attributed to interior well EW-1s (approximately 17 gallons total). Approximately 25 gallons of NAPL were recovered from wells outside the barrier wall in between January 3 and April 20,

2011, which is roughly 7 gallons per month (down from 7.7 gallons per month extracted in 2010 outside the barrier wall). While there is uncertainty involved in quantifying the extraction volumes, the method of recovery and quantification remained consistent. The bulk of the DNAPL outside the barrier wall was recovered from MW-20i. Relatively small amounts of DNAPL were extracted from MW-Ds and MW-Gs.

Since NAPL recovery was discontinued in late April 2011, NAPL thicknesses outside the barrier wall have been consistent with historic thicknesses. The post-extraction monitoring well gauging data supports the conclusions described in the *DNAPL Data Gap Investigation Report*. Although residual product exists outside the barrier wall in the FWDA, the extent of product appears to be confined to small localized stringers of NAPL in the vicinity of MW-20i. These dispersed sources of NAPL are not believed to be of significant quantity or mobility to threaten the Willamette River. NAPL thicknesses will continue to be monitored as part of the semiannual groundwater and NAPL level monitoring events.

3.0 SEMIANNUAL GROUNDWATER MONITORING

Low tide groundwater monitoring was changed from quarterly to semiannual in 2010. Although a change was made in monitoring frequency, the groundwater monitoring methodology remained the same and consisted of (1) manual water level gauging from 79 monitoring wells located at the Site and on the adjacent Burlington Northern and Metro (Willamette Cove area) properties, and (2) collecting continuous automated transducer data from a subset of the wells. Groundwater monitoring data is used to understand groundwater flow conditions inside and outside of the barrier wall. This information is evaluated to determine whether the barrier wall and impermeable Resource Conservation and Recovery Act (RCRA) type soil cap are functioning as designed.

3.1 Water Level Measurements

Manual measurements of static groundwater levels were conducted on June 10 and October 25, 2011. These measurements were typically collected during or immediately following low tide in the Willamette River. Shallow groundwater elevation contour maps were developed for each semiannual event (Figures A-17 and A-18, respectively). The groundwater elevation data are included in Tables A-1 (June 10, 2011) and A-2 (October 25, 2011).

In addition to the manual measurements from 79 monitoring wells at the Site, groundwater data were also collected on a 30-minute basis using pressure

transducers at select monitoring wells surrounding the barrier wall. Fourteen wells with transducers are located along the riverfront portion of the barrier wall, in the shallow, intermediate, and deep wells in well clusters MW-36, MW-37, MW-44, and MW-45, and in the shallow wells MW-40s and MW-41s. Transducers also monitored the upland side of the barrier wall in wells MW-52s and MW-53s and interior wells EW-1s and EW-15s to monitor groundwater conditions inside the barrier wall. Several transducers were removed for repair and were not functional for part of the 2011 monitoring period; however these data gaps did not result in an insufficient barrier wall evaluation for 2011.

Historic and annual hydrographs were prepared using the transducer data from paired monitoring wells as shown on Figures A-19 through A-26. The hydrographs compare water-level elevations for selected well sets, river stage elevation, and precipitation data. While data collection from the transducers is on-going and continuous, the transition from quarterly to semiannual groundwater monitoring results in downloading the transducers semiannually (rather than quarterly) for site wells. Thus, the hydrographs show water levels in wells through October 25, 2011, only. Water level data beyond this date will be included in the 2012 Annual Report.

River stage data were recorded on a 30-minute basis from U.S. Geological Survey (USGS) station number 14211720 (USGS, 2011a). This station is located on the upstream side of the Morrison Bridge (River Mile [RM] 12.8). River stage elevation data reported by the USGS are relative to the Portland River Datum at this location. The river stage data are corrected to North American Vertical Datum, 1988, (NAVD88) at the Site (approximately RM 7) by adding 5.001 ft to the USGS reading.

Precipitation data shown on Figures A-19 through A-26 was obtained from the Astor Elementary School rain gage located approximately 0.5 miles from the Site. Daily totals were obtained from the City of Portland Hydra Network available on the USGS website (USGS, 2011b).

3.2 Shallow Groundwater Flow Direction and Horizontal Gradients

As shown in the shallow groundwater contour maps (Figures A-17 and A-18), the shallow horizontal groundwater gradient within the barrier wall is independent of the gradient outside the barrier wall demonstrating that the barrier wall has effectively cut off the hydraulic connection between the shallow groundwater zone inside the barrier wall and the shallow groundwater zone outside the barrier wall.

Since the installation of the barrier wall in 2003, the upland (easterly) groundwater elevations are higher outside of the barrier wall than inside it due to the impediment, which deflects groundwater flow horizontally around the barrier wall from upland areas. Prior to the barrier wall construction, the groundwater flowed directly from the bluff to the Willamette River. After the barrier wall construction and prior to installation of the impermeable RCRA style soil cap, the elevation differences between the exterior upland shallow well MW-53s, and its interior counterpart MW-52s fluctuated from approximately 0.25 ft to 2 ft (Figure A-19). After construction of the impermeable RCRA style soil cap in late 2005, the elevation difference inside versus outside the barrier wall increased to a range of 3 ft to 6 ft, due in part to the reduction in rainwater entering, and a resultant decrease in shallow groundwater elevations inside, the barrier wall. Monitoring in 2011 continues to show that the shallow groundwater inside is not directly hydraulically connected to the shallow groundwater outside the barrier wall.

In 2011, the shallow groundwater elevations within and outside the barrier wall increased due to the very high Willamette River levels and high rainfall events (Figure A-20). Limited water enters into the barrier wall through the permeable riparian zone and from beneath the barrier wall along the river between MW-36/37 and MW-40/41 well clusters (where the barrier wall is not completed into the underlying silt layer). When the Willamette River reaches peak stage, which typically occurs in June each year, it induces a partial reversal of gradient within the northwest corner of the barrier wall (Figure A-17). Due to the deep hydraulic connection through sands discussed above and the change in hydraulic head that the high river level induces, groundwater elevations in the northwest corner within the barrier wall increase in response to the river and the horizontal groundwater gradient reverses with flow towards the MW-36/37 well cluster. The 2011 hydrograph (Figure A-21) for interior wells EW-1s and MW-15s confirms that the shallow groundwater gradient inside the well shifted easterly (shallow groundwater at MW-15s is higher than shallow groundwater at EW-1s) between May 19, 2011, and July 15, 2011.

The shallow groundwater horizontal gradient inside the barrier wall is flat (approximately 0.002 feet per foot [ft/ft]) compared to the shallow horizontal gradient (ranging from 0.002 ft/ft to 0.02 ft/ft) outside the barrier wall. The groundwater contour map (Figure A-18) from October 25, 2011, is representative of groundwater conditions throughout the majority of the year, as indicated by the flat westerly gradient within the barrier wall and the slightly steeper groundwater gradients outside the barrier wall directed westerly toward the river and Willamette Cove.

The frequent fluctuations (~1 foot oscillations) observed in 2008 and 2009 in EW-1s and MW-15s, shown on Figure A-22, were most likely caused by gas produced from the degradation of the wood debris buried at the site escaping through these wells. The elevated groundwater temperatures in EW-1 reflect aerobic oxidation of wood and creosote constituents observed in this area. The oxidation process was most likely initiated via the introduction of oxygen through the well screen in the unsaturated zone of EW-1s when water levels within the barrier wall dropped after construction of the RCRA-style cap. In order to slow biodegradation and reduce temperatures to minimize localized subsidence, an air-tight seal was installed on EW-1s on May 18, 2009. A reduction in oscillation, indicating a reduction in gas production was noted after well EW-1s was sealed. As shown on Figure A-21, temperatures peaked at 38.8°C on July 6, 2009, and have been steadily declining. See Appendix B of the 2009 Annual Report for additional testing results and discussion regarding the upland subsidence in this area. As discussed in Appendix B of this report, upland subsidence in this area has been insignificant since EW-1s was sealed.

3.3 Vertical Gradients

Vertical gradients inside and outside the barrier wall along the Willamette River are best observed in monitoring well clusters MW-36/MW-37 and MW-44/ MW-45. The hydrographs for these wells (Figures A-23 through A-26) indicate that the intermediate and deep zones of the aquifer are in direct hydraulic connection with the river. The intermediate and deep zones both inside and outside of the barrier wall closely mimic the river stage both in elevation and timing with a small vertical gradient that varies between upward and downward with the tidal changes. The exterior shallow wells, also in hydraulic connection with the river, show about a quarter cycle delay from river fluctuations and have dampened amplitude in comparison with the deeper wells.

The fact that the response of the interior shallow wells is either muted or non-existent in comparison with the intermediate and deep zone wells suggests a clear hydraulic disconnect between the shallow aquifer within the barrier wall and the deeper water-bearing zones. The location where the response is greatest, but still significantly muted, is in MW-36s (Figure A-23 and A-24) where a hydraulic connection exists at the base of the barrier wall. In contrast to the muted response of MW-36s to changes in daily river stage elevation, water levels in the shallow interior well MW-44s (Figure A-25 and A-26) are virtually non-responsive to the tidal changes in Willamette River stage. This is reflective of the presence of a confining layer between the shallow and intermediate zones in the vicinity of MW-44.

Although precipitation in the Willamette River watershed ultimately affects the stage of the river, direct precipitation near the Site appears to play a minor role in determining the water levels of wells within the barrier wall and along the river. The RCRA style soil cap was designed to divert precipitation so that little infiltration occurs within the barrier wall. Although some infiltration occurs along the fringes of the soil cap and within the riparian zone, the amount of infiltration is minimal. Between the barrier wall and the river, precipitation inputs are vastly overshadowed by the response of groundwater to variations in river stage. The shallow zone upgradient or cross-gradient from the barrier wall appears to react subtly to precipitation and is less connected to the river because of its distance from the river and the presence of barrier wall, which is sealed into the underlying silt. One location where infiltration may influence groundwater elevations and flow paths is in the infiltration pond that receives diverted runoff from the soil cap. Figure A-18 shows that the groundwater gradient in this area is very flat, and that there may be a slight groundwater mound in this area east of the soil cap.

The net vertical gradients between the shallow and intermediate, intermediate and deep, and shallow and deep zones have been calculated (when possible) using the transducer data from January 1, 2010, to October 25, 2011, and are presented in Table A-6. In all wells, the net annual vertical gradient is downward between the shallow zone and the intermediate and deep zones. The net downward gradient is greater inside the barrier wall (MW-36 and MW-44 clusters) since the net shallow groundwater elevation inside the barrier wall continues to be slightly elevated as compared to the net river elevation. The net vertical gradient outside the barrier wall is smaller while still downward between the shallow zone and intermediate and deep zones. The net vertical gradient is upward between the intermediate and deep zone in wells MW-37, MW-44, and MW-45, which likely indicates that these deeper zones are under confining pressures. A slightly downward net vertical gradient was calculated between the intermediate and deep zone in interior well cluster MW-36. The net vertical gradients in 2011 were very comparable (in both direction and magnitude) to the gradients calculated in 2008 through 2010.

4.0 SUMMARY

DEQ and EPA decided to discontinue NAPL extraction at the Site on April 20, 2011. Subsequent biweekly and monthly NAPL gauging efforts were conducted between May and October 2011 to monitor NAPL recharge in the wells located outside of the barrier wall. Post-recovery NAPL gauging show NAPL thickness within the wells outside the barrier wall initially increased then stabilized at

thicknesses consistent with historic monitoring and recovery data. Based on the findings from the *DNAPL Data Gap Investigation*, subsequent monitoring of the post-extraction NAPL thicknesses in wells in the FWDA, and extensive monitoring of the sediment cap (described in the *Third Five-Year Review Report; DEQ, 2011*), it appears that residual NAPL remaining in the FWDA does not pose a threat to the Willamette River.

With the exception of EW-10s, there was no accumulation of LNAPL outside the barrier wall during the monitoring period. DNAPL was extracted from three wells located outside the barrier wall in the FWDA and one well (EW-1s) located within the barrier wall. Approximately 42 gallons of DNAPL were extracted from the Site between January 3, 2011, and April 20, 2011. Approximately 40% of the 2011 extraction volumes 17 gallons) can be attributed to interior well EW-1s. The remaining 25 gallons, corresponding to approximately 7 gallons per month, were extracted from primarily exterior well MW-20i, with lesser amounts from MW-Ds and MW-Gs. These calculations indicate that 2011 extraction rates are slightly lower than those calculated for 2010 (7.7 gallons per month).

The June 2011 shallow groundwater elevations and gradients were atypical due to the greater than average peak river levels. During this time period, gradient reversals were observed both inside and outside of the barrier wall. By October 2011 the river levels had subsided and groundwater elevations and gradients returned to conditions that are more representative of the Site. Horizontal gradients outside the barrier wall are the greatest during periods of high precipitation and decrease during periods of low precipitation. Groundwater gradients inside the barrier wall remain flat and generally to the west (except when peak river stage causes a reversal in gradient), while outside and upgradient of the wall, shallow groundwater flow is diverted around the barrier wall to the northwest and south. While most of the monitoring wells mimic the stage variations in the Willamette River, the oscillations in the shallow interior walls are delayed and muted and likely due to changes in pressure at depth rather than a hydraulic connection to the river. The large differences in shallow groundwater elevations within the barrier wall as compared to directly outside the barrier wall indicate that these zones are hydraulically separate. Under stable river conditions, vertical groundwater gradients are generally downward inside the barrier wall in the FWDA and former TFA, with the exception of upward gradients observed during high river levels in the former TFA.

Based on the observations made through the 2011 reporting period, it appears that the barrier wall and impermeable soil cap are functioning as designed: groundwater flow and rainwater infiltration are diverted around source areas

contained within the barrier wall, and NAPL contained within the barrier wall is prohibited from migrating to the Willamette River.

5.0 RECOMMENDATIONS AND NEXT STEPS

In September 2011, DEQ and EPA completed the *Third Five-Year Review Report* and determined that the Site remedies are currently protective of human health and the environment. DEQ is in the process of preparing an O&M Plan to reflect the reduced long-term monitoring needs. A Final O&M Plan is expected to be complete by September 2012.

6.0 REFERENCES

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Table A-1 - Groundwater and NAPL Elevations: June 10, 2011
McCormick and Baxter Superfund Site
Portland, Oregon

Well ID	Time	Measuring Point Elevation (ft NAVD88)	Depth to LNAPL (ft)	Depth to water (ft)	Depth to DNAPL (ft)	LNAPL Thickness (ft)	DNAPL Thickness (ft)	Groundwater Elevation LNAPL Corrected (ft NAVD88)
EW-1s	13:18	40.1	23.9	23.9	42.2	Trace	4.7	16.2
EW-2s	11:51	42.4	21.0	21.0		Trace		21.3
EW-8s	12:56	40.5	23.8	23.8	41.5	Trace	13.2	16.7
EW-9s	12:00	40.8		19.5	45.7		0.7	21.2
EW-10s[1]	11:20	29.4	8.3	9.4		1.1		21.1
EW-15s	12:25	43.0	24.4	25.5		1.1		18.6
EW-18s	13:09	40.7		24.2	41.7		3.0	16.6
EW-19s	11:00	25.9		4.8				21.2
EW-23s	12:20	37.6	18.4	18.4		Trace		19.2
MW-1r	10:25	37.6	19.7	19.7		Trace		17.9
MW-2s	12:30	38.3		20.9				17.4
MW-3s	12:25	30.6		9.5				21.1
MW-7 WC	12:34	36.7		15.7				21.0
MW-10r	10:45	41.9		25.5				16.4
MW-15s	11:11	43.3		26.1				17.2
MW-17s	11:28	41.3		23.4				17.9
MW-18s	10:00	43.1		21.9				21.2
MW-20i	11:38	41.4		20.4	70.2		4.5	21.0
MW-22i[1]	10:40	42.3		25.0	51.2		7.8	17.3
MW-23d	11:35	41.1		20.0				21.1
MW-32i	10:10	39.3		21.7				17.6
MW-34i	11:15	32.7		11.6				21.0
MW-35r	10:30	32.3		11.0				21.3
MW-36d	10:25	30.5		10.4				20.0
MW-36i	10:20	30.2		9.2				21.0
MW-36s	10:18	30.7		11.2				19.5
MW-37d	10:40	26.1		5.0				21.0
MW-37i	10:38	25.9		4.8				21.1
MW-37s	10:37	24.9		3.8				21.1
MW-38d	10:55	31.8		10.8				21.0
MW-38i	10:50	32.1		11.0				21.0
MW-38s	10:47	32.3		13.7				18.6
MW-39d	10:58	29.8		8.8				21.0
MW-39i	11:08	30.1		9.1				21.0
MW-39s	11:04	29.8		8.8				21.0
MW-40d	11:17	28.7		7.7				21.0
MW-40i	11:13	28.7		7.8				21.0
MW-40s	11:10	28.3		9.7				18.6
MW-41d	11:27	27.4		6.5				21.0
MW-41i	11:23	27.1		6.1				21.0
MW-41s	11:20	27.8		6.6				21.1
MW-42d	11:45	32.2		11.3				20.9
MW-42i	11:38	32.7		11.7				20.9
MW-42s	11:35	32.4		14.9				17.5
MW-43d	11:55	28.3		7.4				20.9
MW-43i	11:53	30.3		9.4				20.9
MW-43s	11:50	31.1		10.0				21.1
MW-44d	12:06	29.6		8.4				21.2
MW-44i	12:03	29.3		8.9				20.5
MW-44s	12:01	29.6		12.9				16.6
MW-45d	12:09	27.9		6.9				20.9
MW-45i	12:08	28.0		7.1				20.9
MW-45s	12:07	28.2		7.0				21.1

Table A-1 - Groundwater and NAPL Elevations: June 10, 2011
McCormick and Baxter Superfund Site
Portland, Oregon

Well ID	Time	Measuring Point Elevation (ft NAVD88)	Depth to LNAPL (ft)	Depth to water (ft)	Depth to DNAPL (ft)	LNAPL Thickness (ft)	DNAPL Thickness (ft)	Groundwater Elevation LNAPL Corrected (ft NAVD88)
MW-46s	12:14	35.5		18.8				16.7
MW-47s	12:20	35.5		14.3				21.2
MW-48s	12:40	38.7		17.6				21.0
MW-49s	12:44	37.6		23.4 [2]				14.2 [2]
MW-50s	11:47	39.3		19.8				19.5
MW-51s	11:53	39.5		18.7				20.8
MW-52s	12:17	40.7		24.6				16.1
MW-53s	12:15	40.4		19.9				20.5
MW-54s	11:03	41.8		25.3				16.5
MW-55s	11:05	41.0		20.3				20.7
MW-56s	12:43	43.5		25.2				18.3
MW-57s	11:08	42.0		20.7				21.4
MW-58d	10:49	41.4		20.3				21.1
MW-58i	10:44	41.0		20.0				21.0
MW-58s	10:49	41.5		20.4				21.1
MW-59s	12:47	35.9		14.8				21.1
MW-60d	10:15	40.1		18.9				21.1
MW-61s	10:17	43.6		23.3				20.3
MW-62i	11:20	42.6		21.6				21.0
MW-As	10:13	39.3		19.2				20.1
MW-Ds	12:10	42.9		21.7	36.6		2.0	21.3
MW-Gs	11:24	40.2	19.0	19.0	42.1	Trace	2.6	21.2
MW-Ks	10:58	44.1		24.0				20.2
MW-Os	12:00	40.9		20.2				20.7
PW-1d	12:09	44.0		26.4				17.6
PW-2d	12:04	41.8		24.2				17.6

ND = not detected NM = not measured LNAPL specific gravity estimated as 0.981 g/cm^3

[1] NAPL in these wells has historically been shown to be speck-sized globules of product. These trigger the product probe resulting in an overestimation of actual product in the well.

[2] Measurement is suspect; 7 feet lower than neighboring wells on tide barrier wall. Did not include in constructing shallow groundwater contour map (Figure A-17).

Table A-2 - Groundwater and NAPL Elevations: October 25, 2011
McCormick and Baxter Superfund Site
Portland, Oregon

Well ID	Time	Measuring Point Elevation (ft NAVD88)	Depth to LNAPL (ft)	Depth to water (ft)	Depth to DNAPL (ft)	LNAPL Thickness (ft)	DNAPL Thickness (ft)	Groundwater Elevation LNAPL Corrected (ft NAVD88)
EW-1s	10:26	40.1		25.2	41.8		5.1	14.9
EW-2s	12:28	42.4	34.0	34.0		Trace		8.4
EW-8s	12:17	40.5		26.0	52.7		2.0	14.5
EW-9s	11:40	40.8		32.3	45.7		0.7	8.4
EW-10s[1]	11:05	29.4	22.1	23.0		0.9		7.3
EW-15s	11:57	43.0	30.9	38.0		7.1		11.9
EW-18s	10:36	40.7	26.2	26.2	42.7	Trace	2.0	14.6
EW-19s	10:56	25.9		18.0				7.9
EW-23s	12:05	37.6	26.4	30.9		4.5		11.2
MW-1r	9:50	37.6	25.7	25.7		Trace		12.0
MW-2s	12:00	38.3		25.8				12.4
MW-3s	11:53	30.6		16.6				14.0
MW-7 WC	12:24	36.7		25.9				10.8
MW-10r	10:05	41.9		27.4				14.5
MW-15s	10:20	43.3		29.8				13.5
MW-17s	10:40	41.3		27.7				13.6
MW-18s	9:50	43.1		34.5				8.6
MW-20i	11:27	41.4	34.3	34.7	70.7	0.5	4.0	7.2
MW-22i[1]	10:15	42.3		34.3	52.5		6.5	8.0
MW-23d	10:53	41.1		33.5				7.6
MW-32i	11:41	39.3		27.4				12.0
MW-34i	10:25	32.7		25.8				6.9
MW-35r	12:35	32.3		23.3				9.0
MW-36d	10:10	30.5		23.4				7.0
MW-36i	10:07	30.2		23.1				7.1
MW-36s	10:05	30.7		19.2				11.6
MW-37d	10:18	26.1		19.1				7.0
MW-37i	10:15	25.9		18.9				7.0
MW-37s	10:13	24.9		17.2				7.7
MW-38d	10:30	31.8		24.8				7.0
MW-38i	10:26	32.1		24.7				7.4
MW-38s	10:24	32.3		20.2				12.1
MW-39d	10:40	29.8		22.8				7.0
MW-39i	10:37	30.1		23.0				7.1
MW-39s	10:35	29.8		21.9				7.9
MW-40d	10:50	28.7		21.7				7.0
MW-40i	10:47	28.7		21.4				7.4
MW-40s	10:45	28.3		16.9				11.4
MW-41d	10:55	27.4		20.4				7.0
MW-41i	10:58	27.1		20.0				7.1
MW-41s	11:00	27.8		19.9				7.8
MW-42d	11:05	32.2		25.2				7.0
MW-42i	11:03	32.7		25.6				7.1
MW-42s	11:01	32.4		18.4				13.9
MW-43d	11:15	28.3		21.4				7.0
MW-43i	11:12	30.3		23.3				7.1
MW-43s	11:10	31.1		23.5				7.6
MW-44d	11:25	29.6		21.3				8.4
MW-44i	11:23	29.3		21.8				7.5
MW-44s	11:20	29.6		15.1				14.5
MW-45d	11:35	27.9		20.9				7.0
MW-45i	11:31	28.0		20.9				7.1
MW-45s	11:28	28.2		20.3				7.9

Table A-2 - Groundwater and NAPL Elevations: October 25, 2011
McCormick and Baxter Superfund Site
Portland, Oregon

Well ID	Time	Measuring Point Elevation (ft NAVD88)	Depth to LNAPL (ft)	Depth to water (ft)	Depth to DNAPL (ft)	LNAPL Thickness (ft)	DNAPL Thickness (ft)	Groundwater Elevation LNAPL Corrected (ft NAVD88)
MW-46s	11:45	35.5		20.9				14.7
MW-47s	11:41	35.5		27.4				8.1
MW-48s	12:10	38.7		23.3				15.4
MW-49s	12:06	37.6		20.4				17.1
MW-50s	11:03	39.3		24.1				15.1
MW-51s	11:10	39.5		22.4				17.2
MW-52s	11:30	40.7		26.3				14.4
MW-53s	11:25	40.4		24.3				16.1
MW-54s	10:10	41.8		27.6				14.2
MW-55s	10:05	41.0		28.3				12.8
MW-56s	10:47	43.5	30.8	31.7		0.8		12.6
MW-57s	10:15	42.0		32.9				9.1
MW-58d	12:52	41.4		34.9				6.6
MW-58i	12:45	41.0		34.6				6.4
MW-58s	12:40	41.5		33.2				8.3
MW-59s	12:07	35.9		22.5				13.5
MW-60d	10:00	40.1		32.9				7.1
MW-61s	10:00	43.6		31.6				12.0
MW-62i	10:35	42.6		35.7				6.9
MW-As	11:52	39.3		22.5				16.8
MW-Ds	12:40	42.9	34.4	34.4	36.4	Trace	2.3	8.5
MW-Gs	11:15	40.2	32.0	32.0	42.7	Trace	2.0	8.1
MW-Ks	9:49	44.1		30.6				13.6
MW-Os	11:20	40.9		23.7				17.3
PW-1d	11:18	44.0		32.1				11.9
PW-2d	11:15	41.8		29.8				12.0

ND = not detected NM = not measured LNAPL specific gravity estimated as 0.981 g/cm^3

[1] NAPL in these wells has historically been shown to be speck-sized globules of product. These trigger the product probe resulting in an overestimation of actual product in the well.

Table A-3 - NAPL Thickness and Extraction Summary: January 1 to April 20, 2011
McCormick and Baxter Superfund Site
Portland, Oregon

Date Measured	Well Number	Thickness (feet)	Extracted (Gallons) Based on Visual Observation (water + NAPL)[a]
LNAPL			
1/5/2011	EW-10s	**0.6** [b]	NR
1/12/2011	EW-10s	**0.6** [b]	NR
1/20/2011	EW-10s	**0.6** [b]	NR
1/30/2011	EW-10s	**0.6** [b]	NR
2/2/2011	EW-10s	0.3	NR
2/12/2011	EW-10s	**0.6** [b]	NR
2/17/2011	EW-10s	**1.0** [b]	NR
2/23/2011	EW-10s	**0.6** [b]	NR
3/3/2011	EW-10s	**0.4** [b]	NR
3/11/2011	EW-10s	**1.0** [b]	NR
3/19/2011	EW-10s	0.1	NR
3/22/2011	EW-10s	**1.3** [b]	NR
3/29/2011	EW-10s	**0.7** [b]	NR
4/4/2011	EW-10s	**0.6** [b]	NR
4/16/2011	EW-10s	**1.5** [b]	NR
4/20/2011	EW-10s	**1.3** [b]	NR
DNAPL			
1/5/2011	MW-20i	**6.4**	2.5
1/12/2011	MW-20i	**4.9**	2.3
1/20/2011	MW-20i	**5.9**	2.3
1/30/2011	MW-20i	**4.9**	NR
2/2/2011	MW-20i	**6.3**	2.3
2/12/2011	MW-20i	**5.8**	NR
2/17/2011	MW-20i	**5.8**	2.3
2/23/2011	MW-20i	**5.4**	2.3
3/3/2011	MW-20i	**4.6**	2.0
3/11/2011	MW-20i	**5.5**	2.3
3/19/2011	MW-20i	**3.3**	2.0
3/22/2011	MW-20i	**4.9**	1.8
3/29/2011	MW-20i	**4.7**	2.0
4/4/2011	MW-20i	**4.4**	2.3
4/16/2011	MW-20i	**4.5**	2.3
4/20/2011	MW-20i	**4.0**	2.0
1/5/2011	MW-Ds	1.1	NR
1/12/2011	MW-Ds	**1.5**	NR
1/20/2011	MW-Ds	**1.8**	1.3
1/30/2011	MW-Ds	**1.5**	NR
2/2/2011	MW-Ds	1.4	NR
2/12/2011	MW-Ds	**1.7**	NR
2/17/2011	MW-Ds	**1.7**	NR
2/23/2011	MW-Ds	**2.0**	NR
3/3/2011	MW-Ds	**2.2**	1.3
3/11/2011	MW-Ds	0.8	NR

Table A-3 - NAPL Thickness and Extraction Summary: January 1 to April 20, 2011
McCormick and Baxter Superfund Site
Portland, Oregon

Date Measured	Well Number	Thickness (feet)	Extracted (Gallons) Based on Visual Observation (water + NAPL)[a]
3/19/2011	MW-Ds	**2.3**	1.0
3/22/2011	MW-Ds	**1.8**	1.0
3/29/2011	MW-Ds	1.0	NR
4/4/2011	MW-Ds	**1.6**	NR
4/16/2011	MW-Ds	**1.6**	NR
4/20/2011	MW-Ds	1.4	NR
1/5/2011	MW-Gs	1.3	NR
1/12/2011	MW-Gs	1.4	NR
1/20/2011	MW-Gs	1.3	NR
1/30/2011	MW-Gs	1.4	NR
2/2/2011	MW-Gs	1.3	NR
2/12/2011	MW-Gs	1.3	NR
2/17/2011	MW-Gs	1.3	NR
2/23/2011	MW-Gs	1.3	NR
3/3/2011	MW-Gs	1.3	NR
3/11/2011	MW-Gs	**3.1**	1.3
3/19/2011	MW-Gs	**1.6**	1.0
3/22/2011	MW-Gs	**1.5**	NR[c]
3/29/2011	MW-Gs	1.1	NR
4/4/2011	MW-Gs	1.3	NR
4/16/2011	MW-Gs	0.2	NR
4/20/2011	MW-Gs	**1.5**	1.0
1/5/2011	EW-1s	**2.7**	2.3
1/12/2011	EW-1s	**2.2**	2.0
1/20/2011	EW-1s	**2.8**	1.8
1/30/2011	EW-1s	**2.2**	NR
2/2/2011	EW-1s	**4.0**	1.8
2/12/2011	EW-1s	**2.7**	NR
2/17/2011	EW-1s	**2.7**	1.8
2/23/2011	EW-1s	**1.4**	1.8
3/3/2011	EW-1s	**3.2**	1.8
3/11/2011	EW-1s	**3.2**	1.5
3/19/2011	EW-1s	**3.7**	2.3
3/22/2011	EW-1s	**2.7**	1.8
3/29/2011	EW-1s	**2.7**	1.8
4/4/2011	EW-1s	1.2	2.0
4/16/2011	EW-1s	**2.7**	1.8
4/20/2011	EW-1s	**3.0**	2.0
Total Water and NAPL Extracted			**64.2**

Notes:
Bold values indicate the Extraction Criteria have been met: minimum of 0.4 feet for LNAPL and 1.5 feet for
NR = No Recovery
[a] Extracted volume based on visual observations at time of extraction for water + NAPL.
[b] Historically, the water recovered with the bailer from the top of the water column in EW-10s has speck sized globules of product dispersed through the water column indicating that no discrete layer of product is present.

Table A-4 - NAPL Thickness Summary: May 17 to October 25, 2011
McCormick and Baxter Superfund Site
Portland, Oregon

Date Measured	Well Number	Thickness (feet)
LNAPL		
5/17/2011	EW-10s	0.9
5/27/2011	EW-10s	1.3
6/10/2011	EW-10s	1.1
6/29/2011	EW-10s	1.2
7/22/2011	EW-10s	1.1
8/15/2011	EW-10s	1.7
9/16/2011	EW-10s	2.0
10/25/2011	EW-10s	0.9
10/25/2011	MW-20i	0.5
DNAPL		
5/17/2011	MW-20i	6.1
5/27/2011	MW-20i	6.5
6/10/2011	MW-20i	4.5
6/29/2011	MW-20i	4.5
7/22/2011	MW-20i	4.5
8/15/2011	MW-20i	4.3
9/16/2011	MW-20i	4.2
10/25/2011	MW-20i	4.0
5/17/2011	MW-Ds	2.0
5/27/2011	MW-Ds	2.2
6/10/2011	MW-Ds	2.0
6/29/2011	MW-Ds	2.1
7/22/2011	MW-Ds	2.1
8/15/2011	MW-Ds	2.2
9/16/2011	MW-Ds	2.5
10/25/2011	MW-Ds	2.3
5/17/2011	MW-Gs	6.2
5/27/2011	MW-Gs	6.7
6/10/2011	MW-Gs	2.6
6/29/2011	MW-Gs	2.2
7/22/2011	MW-Gs	1.9
8/15/2011	MW-Gs	1.9
9/16/2011	MW-Gs	1.8
10/25/2011	MW-Gs	2.0
5/17/2011	EW-1s	3.5
5/27/2011	EW-1s	3.5
6/10/2011	EW-1s	4.7
6/29/2011	EW-1s	5.2
7/22/2011	EW-1s	5.0
8/15/2011	EW-1s	5.0
9/16/2011	EW-1s	5.1
10/25/2011	EW-1s	5.1
6/10/2011	EW-9s	0.7
7/22/2011	EW-9s	0.8

Table A-4 - NAPL Thickness Summary: May 17 to October 25, 2011
McCormick and Baxter Superfund Site
Portland, Oregon

Date Measured	Well Number	Thickness (feet)
8/15/2011	EW-9s	0.7
9/16/2011	EW-9s	0.7
10/25/2011	EW-9s	0.7

Notes:

NAPL extraction has not been conducted since April, 20 2011.

Table A-5 - Cumulative NAPL Extraction Summary
McCormick and Baxter Superfund Site
Portland, Oregon

Date	Manual NAPL Extracted (DNAPL + LNAPL)	Treatment System NAPL Extracted (DNAPL & LNAPL)	Manual plus Treatment System NAPL Extracted (gallons)	Total NAPL Extracted (gallons)
Pre-Barrier Wall Extraction Volumes				
Jun-89			0	0
Feb-93			1097	1097
Feb-95			1021	2118
Dec-95	31.03	0	31.03	2149
Jan-96	20.8	0	20.8	2170
Feb-96	52.4	0	52.4	2222
Mar-96	66.05	0	66.05	2288
Apr-96	35.87	0	35.87	2324
May-96	23.36	0	23.36	2348
Jun-96	31.68	0	31.68	2379
Jul-96	29.8	0	29.8	2409
Aug-96	73.02	0	73.02	2482
Sep-96	33.5	0	33.5	2516
Oct-96	43.8	0	43.8	2559
Nov-96	39	0	39	2598
Dec-96	25.3	0	25.3	2624
Jan-97	40.36	0	40.36	2664
Feb-97	31.04	0	31.04	2695
Mar-97	34.18	0	34.18	2729
Apr-97	32.04	0	32.04	2761
May-97	8.64	0	8.64	2770
Jun-97	11.6	0	11.6	2781
Jul-97	28.29	0	28.29	2810
Aug-97	52.33	0	52.33	2862
Sep-97	38.9	0	38.9	2901
Oct-97	32.3	0	32.3	2933
Nov-97	53.8	0	53.8	2987
Dec-97	53.3	0	53.3	3040
Jan-98	33.17	112.32	145.49	3186
Feb-98	27.05	5.9	32.95	3219
Mar-98	51.1	3.83	54.93	3274
Apr-98	33.37	7.67	41.04	3315
May-98	31.45	7.67	39.12	3354
Jun-98	12.08	7.67	19.75	3374
Jul-98	9.34	8.11	17.45	3391
Aug-98	14.95	8.11	23.06	3414
Sep-98	14.17	8.11	22.28	3436
Oct-98	16	8.11	24.11	3461
Nov-98	11.3	8.11	19.41	3480
Dec-98	5.2	16.15	21.35	3501
Jan-99	15.28	0	15.28	3517
Feb-99	14.12	0	14.12	3531
Mar-99	47.74	0	47.74	3578
Apr-99	7.44	0	7.44	3586
May-99	12.82	0	12.82	3599
Jun-99	10.7	0	10.7	3609

Table A-5 - Cumulative NAPL Extraction Summary
McCormick and Baxter Superfund Site
Portland, Oregon

Date	Manual NAPL Extracted (DNAPL + LNAPL)	Treatment System NAPL Extracted (DNAPL & LNAPL)	Manual plus Treatment System NAPL Extracted (gallons)	Total NAPL Extracted (gallons)
Jul-99	6.6	7.85	14.45	3624
Aug-99	13.84	7.85	21.69	3646
Sep-99	35.88	7.85	43.73	3689
Oct-99	6.85	7.85	14.7	3704
Nov-99	7.47	7.85	15.32	3719
Dec-99	2.15	7.85	10	3729
Jan-00	3.46	21.17	24.63	3754
Feb-00	1.75	21.17	22.92	3777
Mar-00	0.98	21.17	22.15	3799
Apr-00	1.05	21.17	22.22	3821
May-00	1.9	21.17	23.07	3844
Jun-00	0.41	21.17	21.58	3866
Jul-00	14.5	21.7	36.2	3902
Aug-00	25.36	21.7	47.06	3949
Sep-00	21.83	21.6	43.43	3993
Oct-00	18.63	0	18.63	4011
Nov-00	17.38	0	17.38	4029
Dec-00	1.53	0	1.53	4030
Jan-01	4.09	0	4.09	4034
Feb-01	0.56	0	0.56	4035
Mar-01	2.64	0	2.64	4037
Apr-01	4.19	0	4.19	4042
May-01	1.36	0	1.36	4043
Jun-01	0.41	0	0.41	4043
Jul-01	0.64	0	0.64	4044
Aug-01	1.15	0	1.15	4045
Sep-01	0	0	0	4045
Oct-01	0	0	0	4045
Nov-01	5.98	0	5.98	4051
Dec-01	0.519	0	0.519	4052
Jan-02	0.46	0	0.46	4052
Feb-02	19.28	0	19.28	4071
Mar-02	18.66	0	18.66	4090
Apr-02	0.31	0	0.31	4090
May-02	5.065	0	5.065	4095
Jun-02	0	0	0	4095
Jul-02	13.81	0	13.81	4109
Aug-02	11.59	0	11.59	4121
Sep-02	8.76	0	8.76	4130
Oct-02	12.34	0	12.34	4142
Nov-02	10.19	0	10.19	4152
Dec-02	0.851	0	0.851	4153
Jan-03	1.514	0	1.514	4154
Feb-03	7.45	0	7.45	4162
Mar-03	1.73	0	1.73	4164
Apr-03	0	0	0	4164
May-03	0	0	0	4164

Table A-5 - Cumulative NAPL Extraction Summary
McCormick and Baxter Superfund Site
Portland, Oregon

Date	Manual NAPL Extracted (DNAPL + LNAPL)	Treatment System NAPL Extracted (DNAPL & LNAPL)	Manual plus Treatment System NAPL Extracted (gallons)	Total NAPL Extracted (gallons)
Jun-03	0	0	0	4164
Jul-03	0	0	0	4164
Aug-03	0	0	0	4164
Sep-03	0	0	0	4164
Oct-03	0	0	0	4164
Nov-03	10	0	10	4174
Feb-04	79.5	0	79.5	4253
Mar-04	94.5	0	94.5	4348
Post Barrier Wall Extraction Volume				
Apr-04	118.33	0	118.33	4466
May-04	163.6	0	163.6	4630
Jun-04	165.6	0	165.6	4795
Jul-04	103.3	0	103.3	4898
Aug-04	127	34.1	161.1	5060
Sep-04	98.4	32.84	131.24	5191
Oct-04	50.2	28.76	78.96	5270
Nov-04	61.44	34.3	95.74	5366
Dec-04	59.12	23.51	82.63	5448
Jan-05	49.1	24.1	73.2	5521
Feb-05	83.86	0	83.86	5605
Mar-05	132.7	1	133.7	5739
Apr-05	131.2	0	131.2	5870
May-05	66.2	0	66.2	5936
Oct-05	45	0	45	5981
Nov-05	5.16	0	5.16	5986
Dec-05	12.33	0	12.33	5999
Jan-06	13.43	0	13.43	6012
Feb-06	14.68	0	14.68	6027
Mar-06	17.17	0	17.17	6044
Apr-06	13.24	0	13.24	6057
May-06	19.43	0	19.43	6076
Jun-06	16.72	0	16.72	6092
Jul-06	14.98	0	14.98	6107
Aug-06	27.37	0	27.37	6135
Sep-06	12.19	0	12.19	6147
Dec-06	9.93	0	9.93	6157
Mar-07	10.5	0	10.5	6167
Jun-07	14.86	0	14.86	6182
Sep-07	10.08	0	10.08	6192
Dec-07	9.93	0	9.93	6202
Feb-08	4.5	0	4.5	6207
Jun-08	19.7	0	19.7	6227
Jul-08	13.9	0	13.9	6240
Nov-08	19.2	0	19.2	6260
Mar-09	31	0	31	6291
Jun-09	29.76	0	29.76	6320
Sep-09	23.56	0	23.56	6344

Table A-5 - Cumulative NAPL Extraction Summary
McCormick and Baxter Superfund Site
Portland, Oregon

Date	Manual NAPL Extracted (DNAPL + LNAPL)	Treatment System NAPL Extracted (DNAPL & LNAPL)	Manual plus Treatment System NAPL Extracted (gallons)	Total NAPL Extracted (gallons)
Sep-09	12.4	0	12.4	6356
Dec-09	7.44	0	7.44	6364
Jan-10	9.3	0	9.3	6373
Mar-10	17.36	0	17.36	6390
Jun-10	34.1	0	34.1	6425
Sep-10	34.1	0	34.1	6459
Nov-10	34.1	0	34.1	6493
Jan-11	16.74	0	16.74	6509
Apr-11	42.16	0	42.16	6552
Total Extracted Volume				6552

Note:
NAPL volume was estimated as 62% of the drum volume each measuring period. This calculation assumes that water comprises 38% of the drum volume, although the actual quantity varies from about 10% to over 50%.

Table A-6 - Net Annual Vertical Gradients in Monitoring Well Clusters: 2011
McCormick and Baxter Superfund Site
Portland, Oregon

Monitoring Well Cluster ID	2011 Net Annual Vertical Gradient		
	From shallow to intermediate zone	From intermediate to deep zone	From shallow to deep zone
MW-36 (Interior)	-0.0594	-- [a]	-- [a]
MW-37 (Exterior)	-0.0037	0.0023	-0.0001
MW-44 (Interior)	-0.0962 [b]	0.0168 [b]	-0.0096 [c]
MW-45 (Exterior)	-0.0326	0.0030	-0.0123

Notes:
Negative values indicate a net downward hydraulic gradient and positive values indicate a net upward hydraulic gradient.
[a] No reliable data was collected from the MW-36d transducer in 2011.
[b] MW-44s and MW-44i are missing data between 5/3/2011 and 6/10/2011. The net gradient calculations exclude this period.
[c] MW-44d is missing data after 5/3/2011 due to transducer malfunctions. Net Gradient calculations exclude this period.

LEGEND

- Groundwater Monitoring Wells with Transducers
- All Other Groundwater Monitoring Wells
- Subsurface Barrier Wall

NOTE: Aerial photo taken on September 22, 2006

0 200 400

Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

Groundwater Monitoring Well Location Map

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Figure
A-1

File Path: P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project_GIS\Project_mxds\2011_Annual_Report\FigureA-1_Monitoring_Well_Location_Map.mxd

LEGEND

Groundwater Monitoring Wells (Depth to LNAPL or DNAPL)

- Wells with LNAPL
- Wells with DNAPL
- Wells without LNAPL or DNAPL
- Subsurface Barrier Wall

NOTES:

1) Aerial photo taken on September 22, 2006.
2) LNAPL recovery periodically attempted when LNAPL thickness appears to be greater than 0.4 feet. However, the water recovered with the bailer from the top of the water column has speck sized globules of product dispersed through the water column indicating that no discrete layer of product is present.
3) DNAPL recovery was attempted in July 2007 but the extracted liquid appeared to be water with speck sized globules of DNAPL (with a creosote odor), rather than a distinct layer, suggesting that the DNAPL thicknesses measured may not accurately reflect the amount of DNAPL in the well. Because MW-22i is located within the barrier wall, no further extraction has been conducted.

0 200 400

Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

LNAPL and DNAPL Distribution Map for June 10, 2011 Sampling Event

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Figure **A-2**

File Path: P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project GIS\Project mxds\2011 Annual Report\FigureA-2 LNAPL and DNAPL Map June10 2011.mxd

LEGEND

Groundwater Monitoring Wells (Depth to LNAPL or DNAPL)

- Wells with LNAPL
- Wells with DNAPL
- Wells without LNAPL or DNAPL
- Subsurface Barrier Wall

NOTES:

1) Aerial photo taken on September 22, 2006.
2) LNAPL recovery periodically attempted when LNAPL thickness appears to be greater than 0.4 feet. However, the water recovered with the bailer from the top of the water column has speck sized globules of product dispersed through the water column indicating that no discrete layer of product is present.
3) MW-20i also has 0.5 ft of LNAPL

0 200 400

Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

LNAPL and DNAPL Distribution Map for October 25, 2011 Sampling Event

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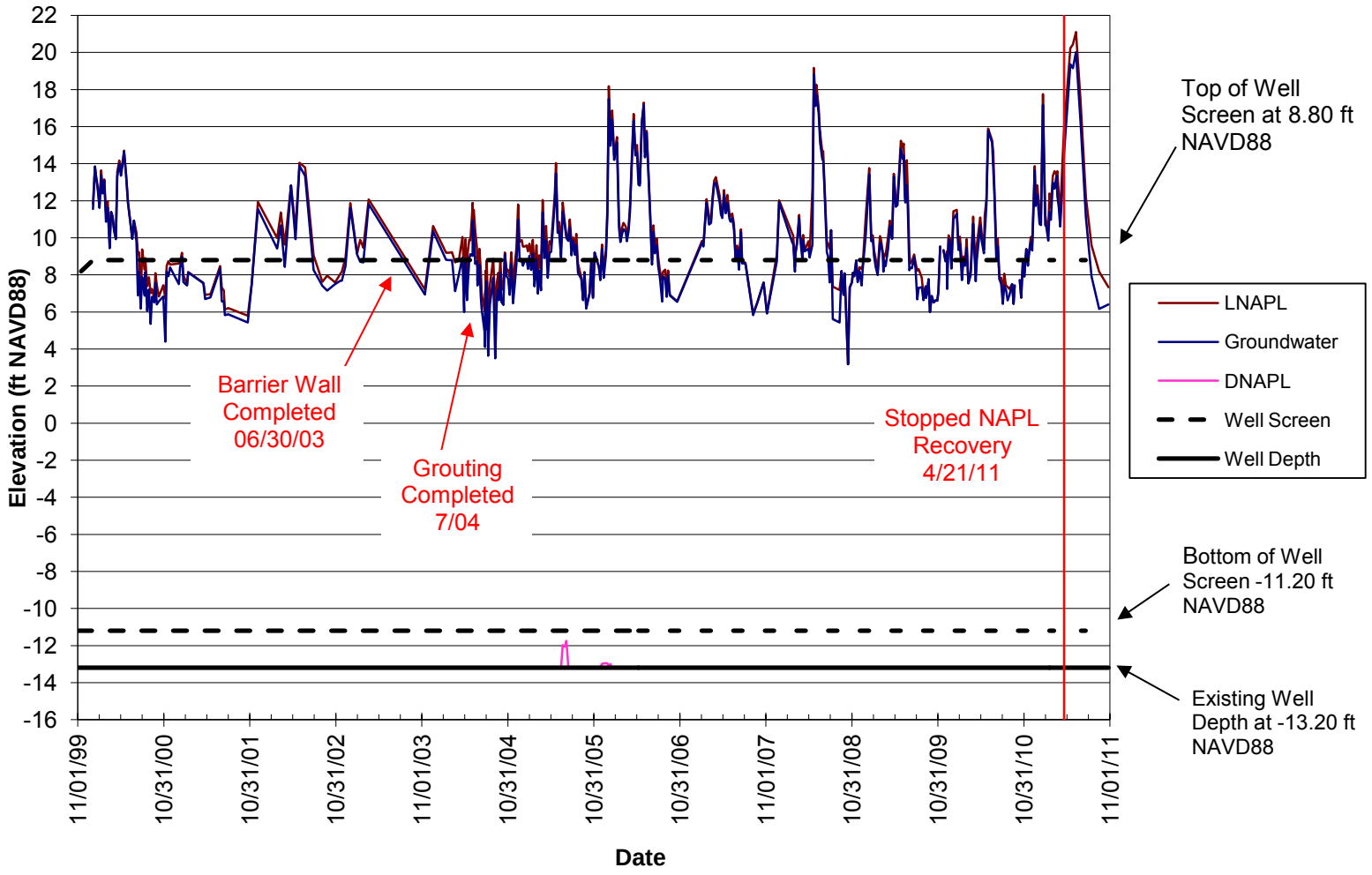
Figure **A-3**

File Path: P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project GIS\Project mxds\2011 Annual Report\FigureA-3 LNAPL and DNAPL Map Oct25 2011.mxd



McCormick and Baxter Superfund Site
Portland, Oregon

1999 to 2011 NAPL Thickness Plot for Well EW-10s

5/12

Figure **A-4**

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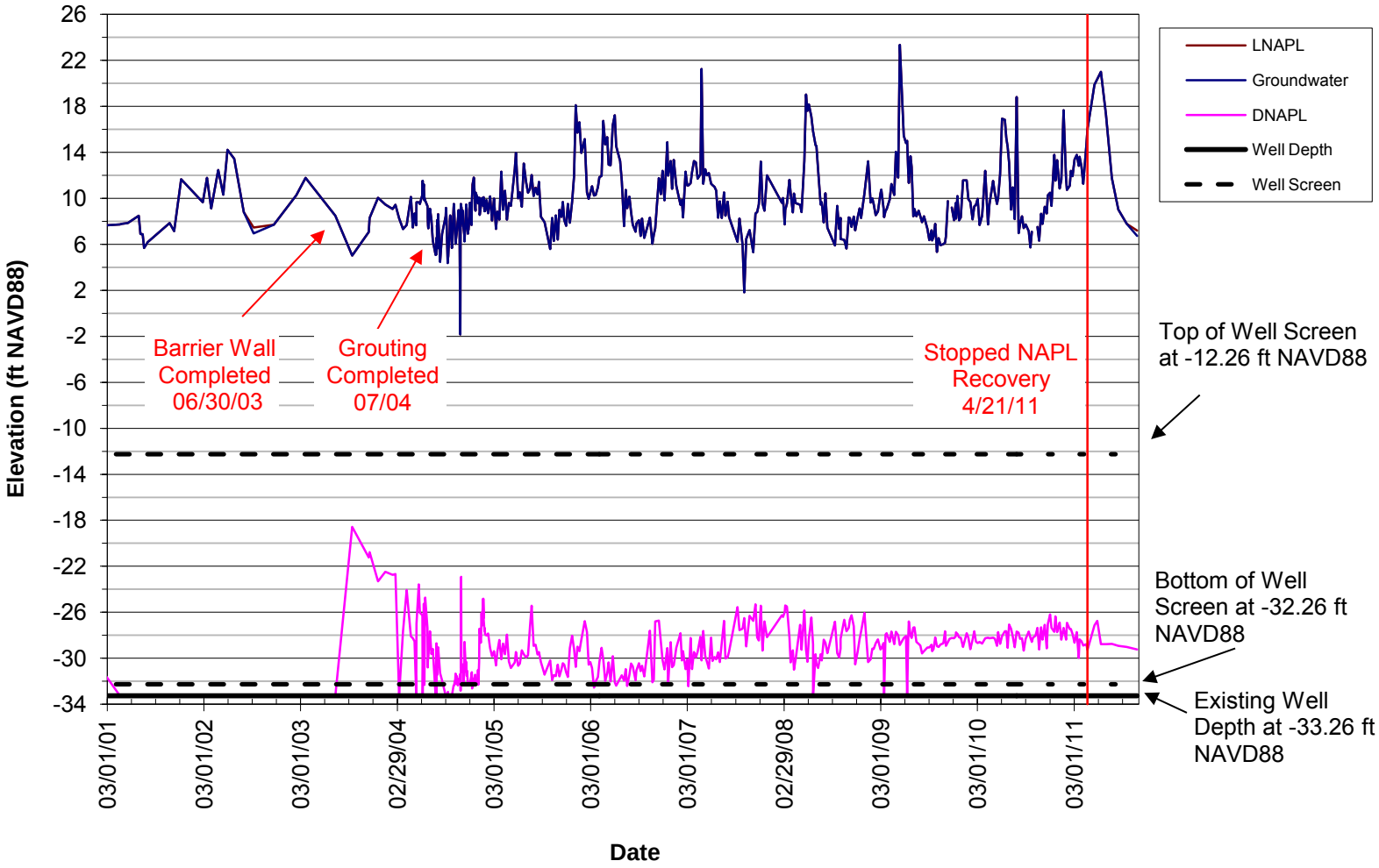

Note: DNAPL recovery was attempted in July 2007 but the extracted liquid appeared to be water with speck sized globules of DNAPL (with a creosote odor), rather than a distinct layer, suggesting that the DNAPL thicknesses measured may not accurately reflect the amount of DNAPL in the well.

McCormick and Baxter Superfund Site
Portland, Oregon

2001 to 2011 NAPL Thickness Plot for Well MW-20i

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Figure **A-5a**

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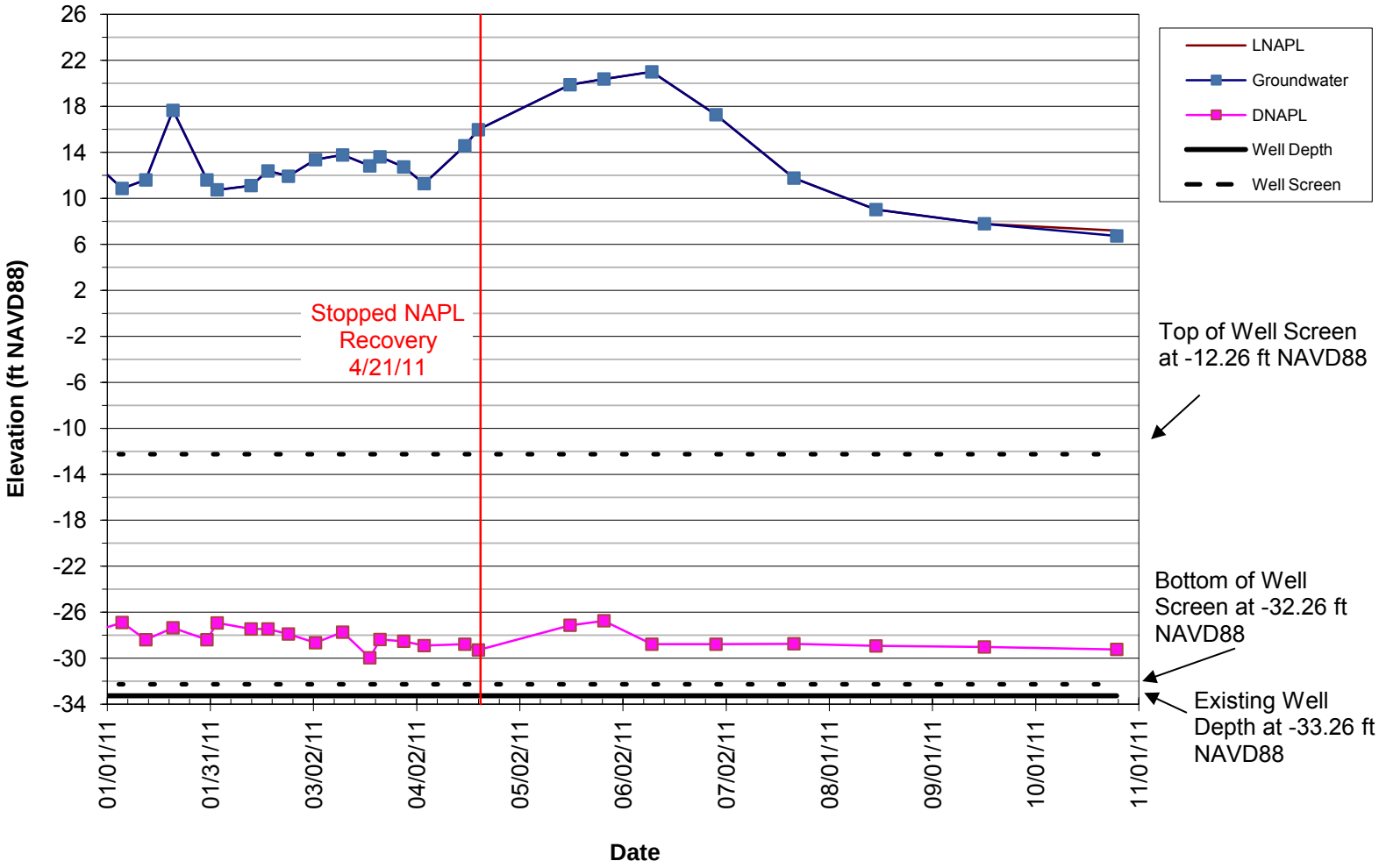

Note: DNAPL recovery was attempted in July 2007 but the extracted liquid appeared to be water with speck sized globules of DNAPL (with a creosote odor), rather than a distinct layer, suggesting that the DNAPL thicknesses measured may not accurately reflect the amount of DNAPL in the well.

McCormick and Baxter Superfund Site
Portland, Oregon

2011 NAPL Thickness Plot for Well MW-20i

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Figure **A-5b**

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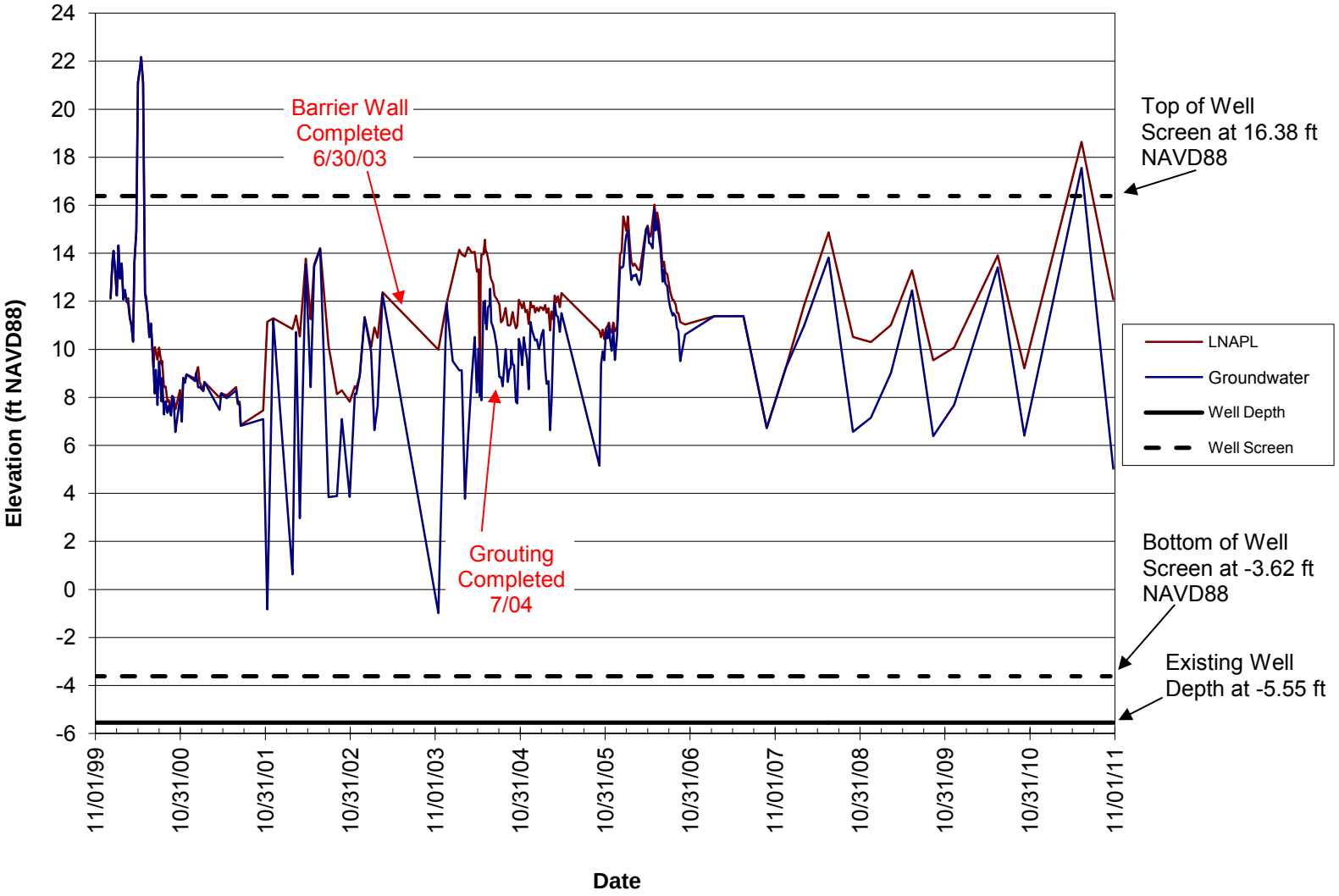

McCormick and Baxter Superfund Site
Portland, Oregon

1999 to 2011 NAPL Thickness Plot for Well EW-15s

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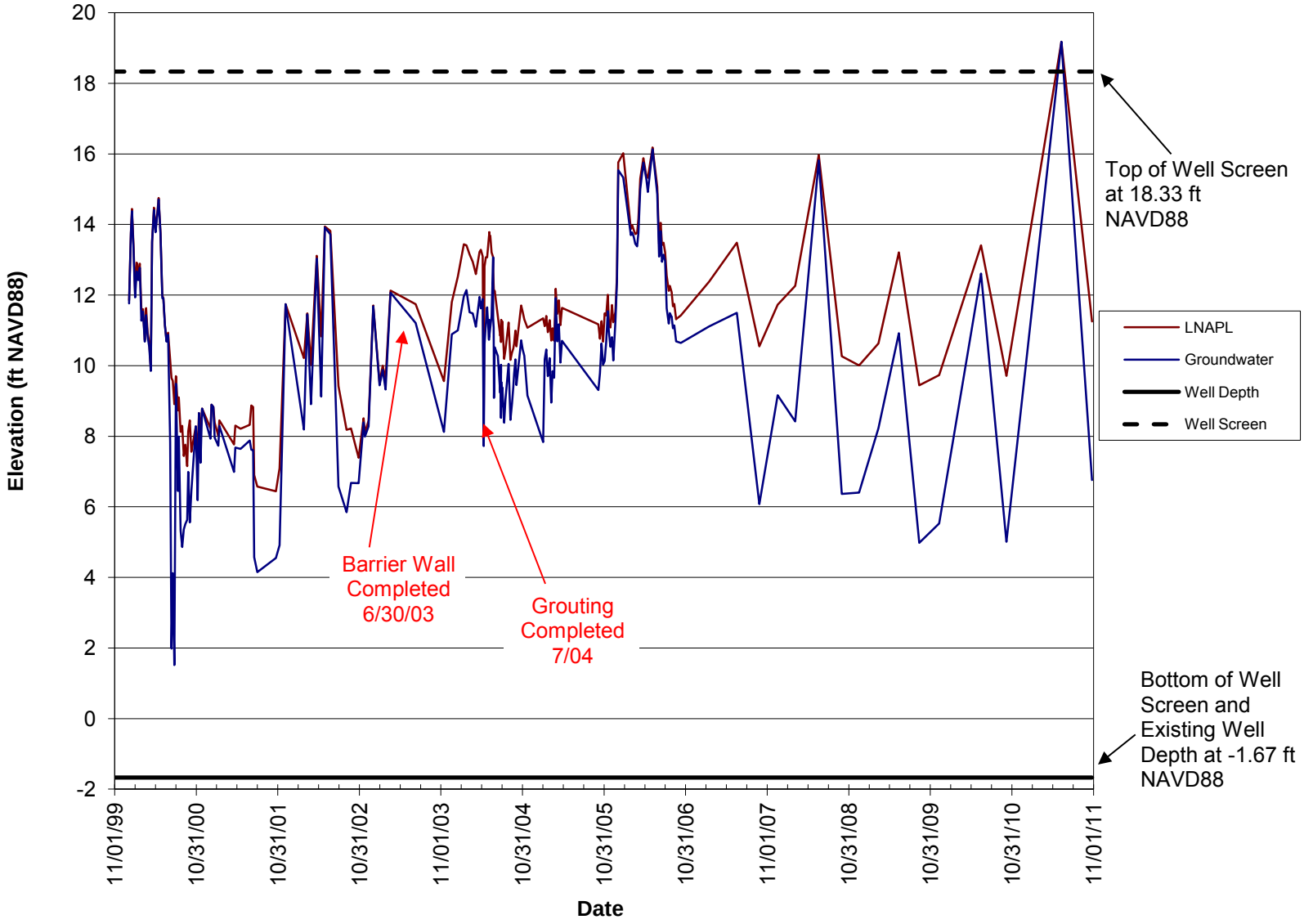
Figure **A-6**



McCormick and Baxter Superfund Site
Portland, Oregon

1999 to 2011 NAPL Thickness Plot for Well EW-23s

5/12

Figure **A-7**

HARTCROWSER

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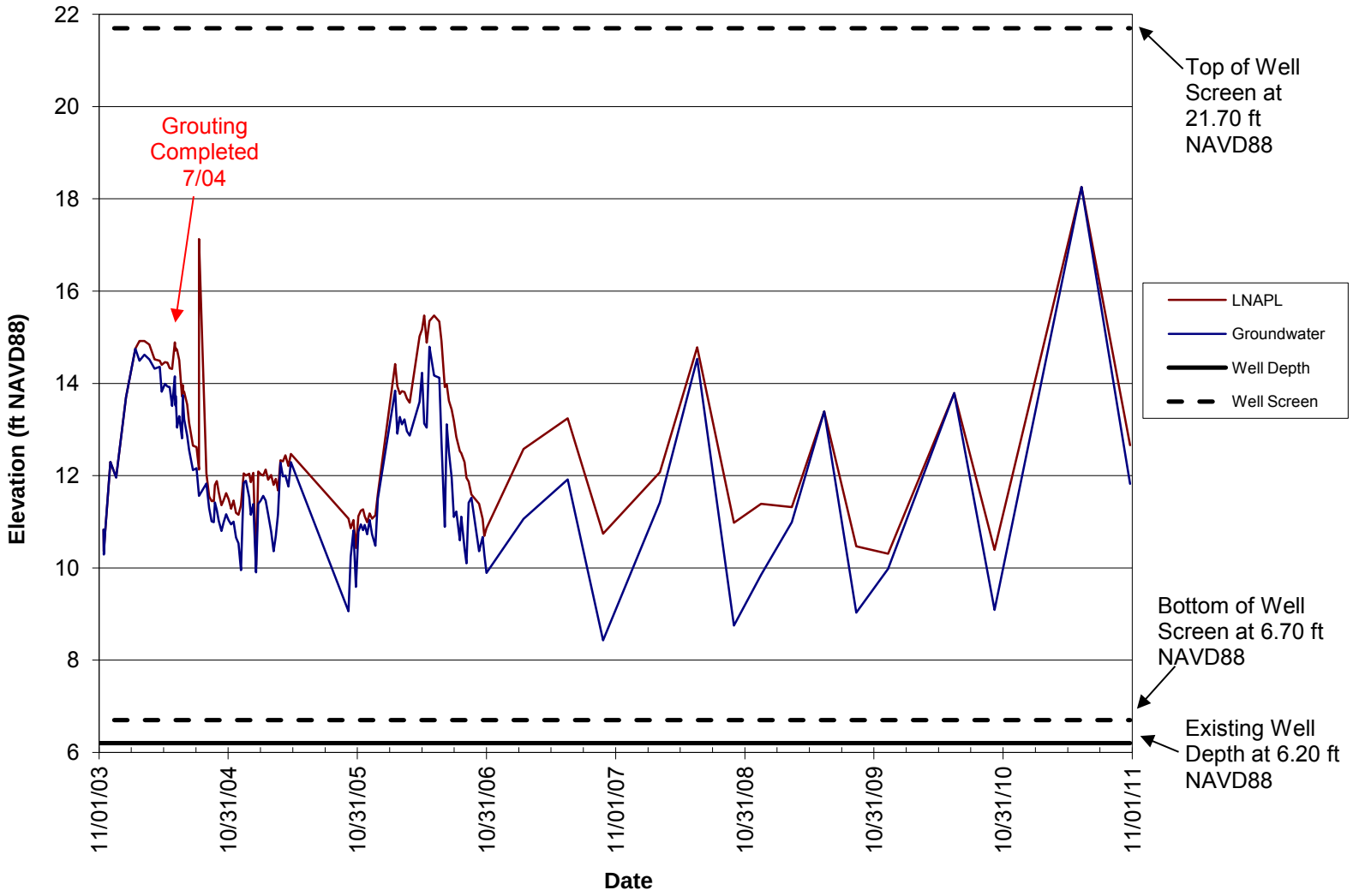

McCormick and Baxter Superfund Site
Portland, Oregon

2003 to 2011 NAPL Thickness Plot for Well MW-56s

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Figure **A-8**

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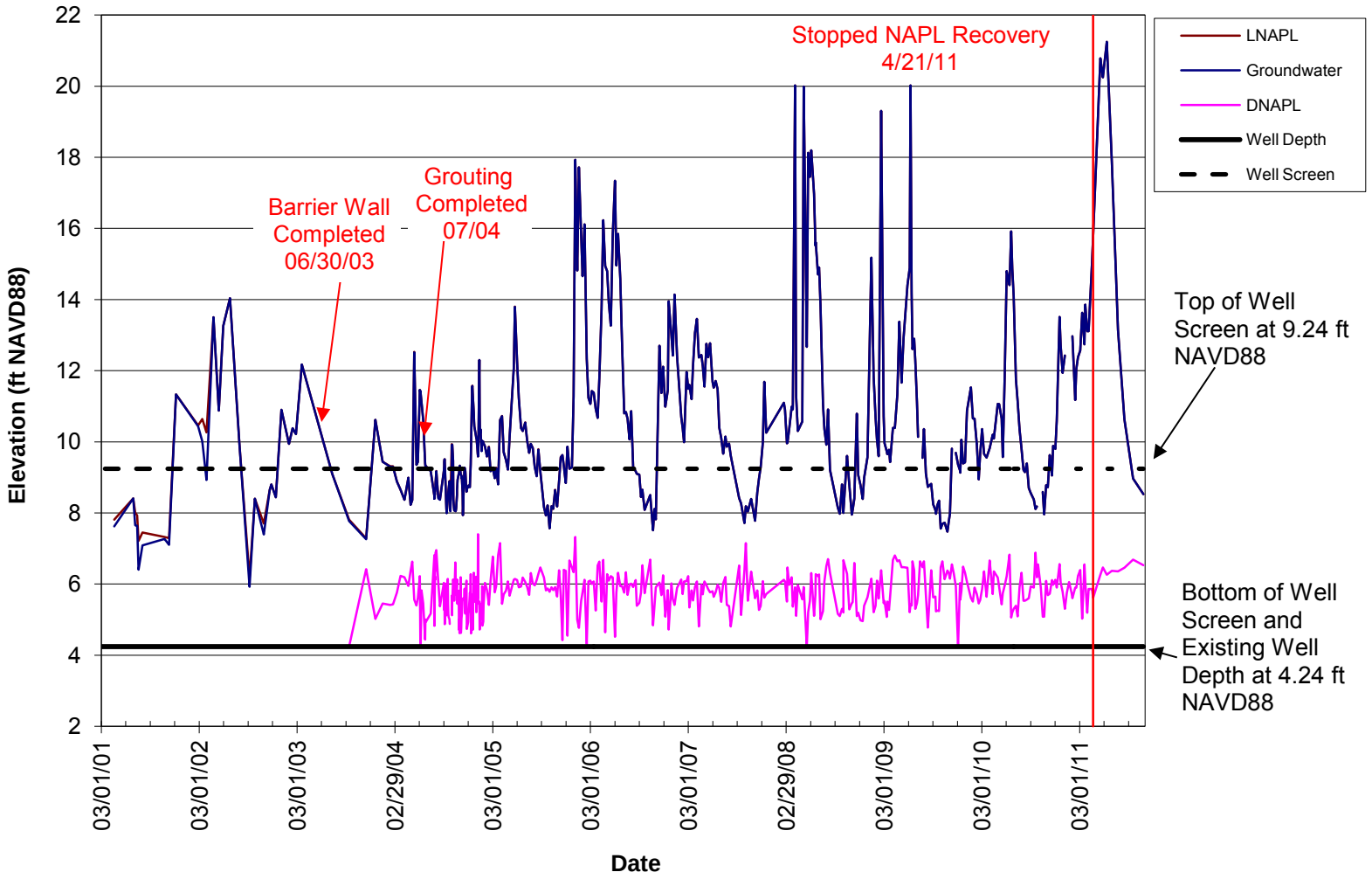

McCormick and Baxter Superfund Site
Portland, Oregon

2001 to 2011 NAPL Thickness Plot for Well MW-Ds

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Figure **A-9a**

HARTCROWSER

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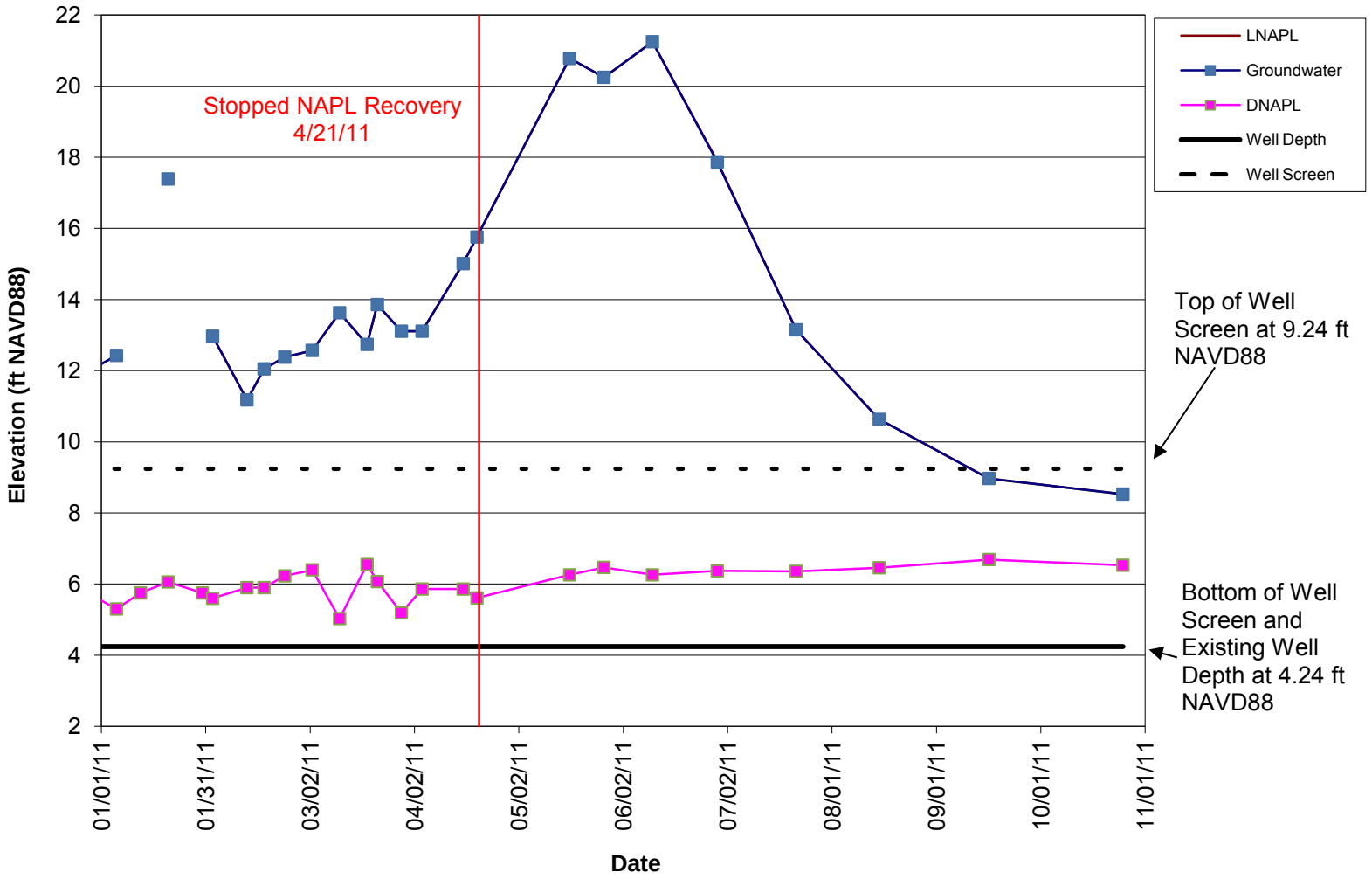

McCormick and Baxter Superfund Site
Portland, Oregon

2011 NAPL Thickness Plot for Well MW-Ds

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Figure
A-9b

HARTCROWSER

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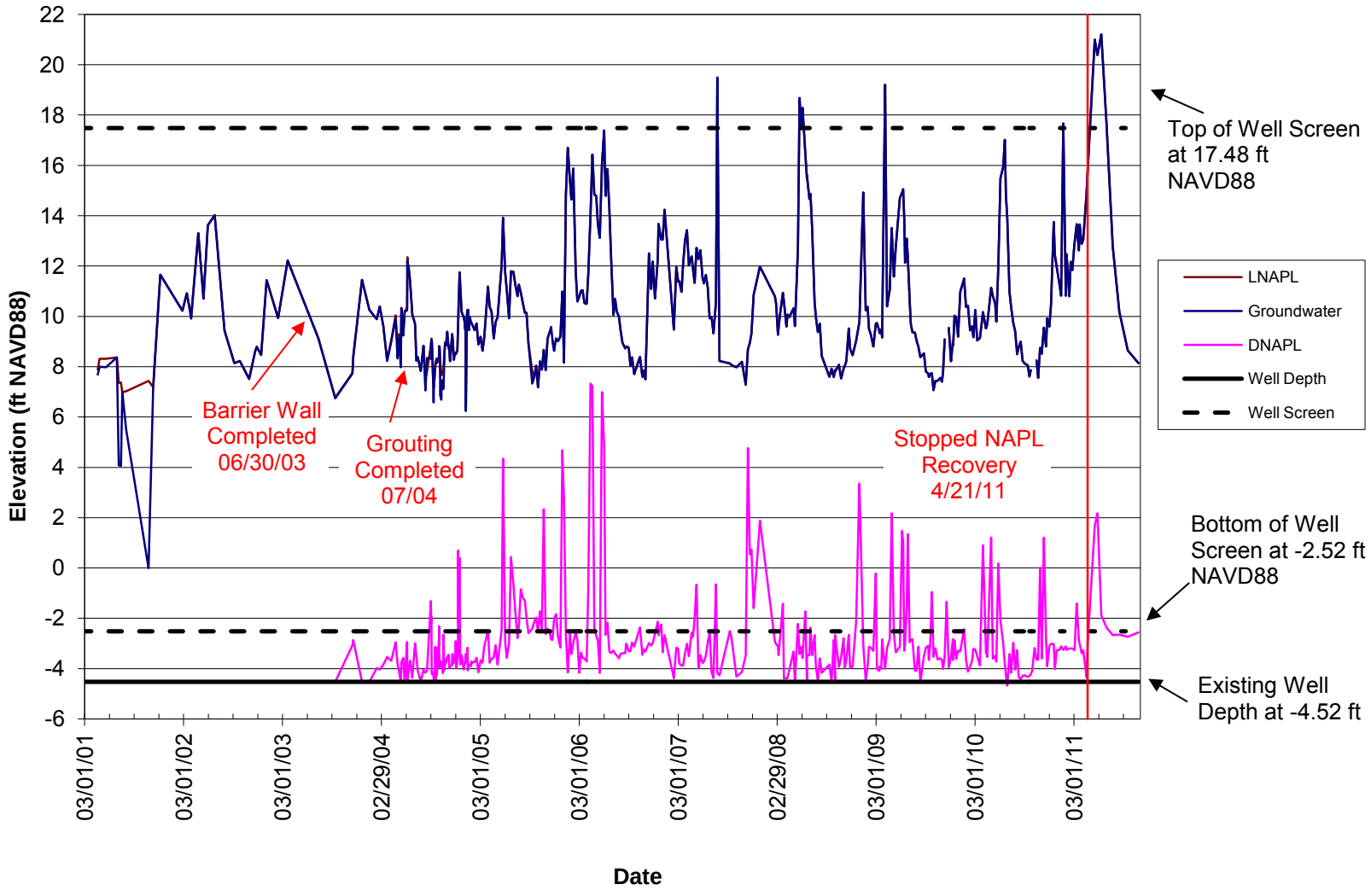

McCormick and Baxter Superfund Site
Portland, Oregon

2001 to 2011 NAPL Thickness Plot for Well MW-Gs

5/12

Figure **A-10a**

HARTCROWSER

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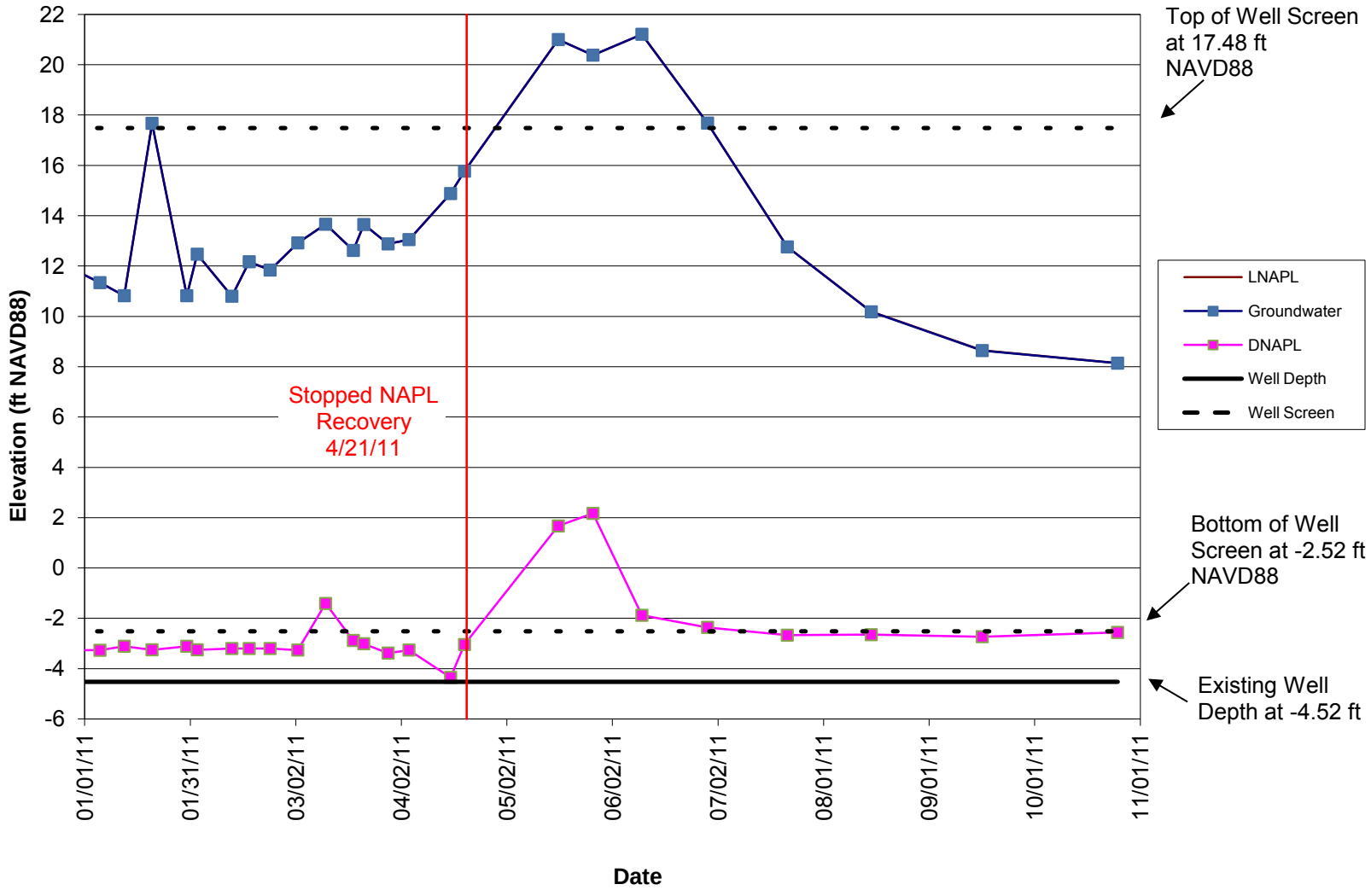

McCormick and Baxter Superfund Site
Portland, Oregon

2011NAPL Thickness Plot for Well MW-Gs

5/12

Figure
A-10b

HARTCROWSER

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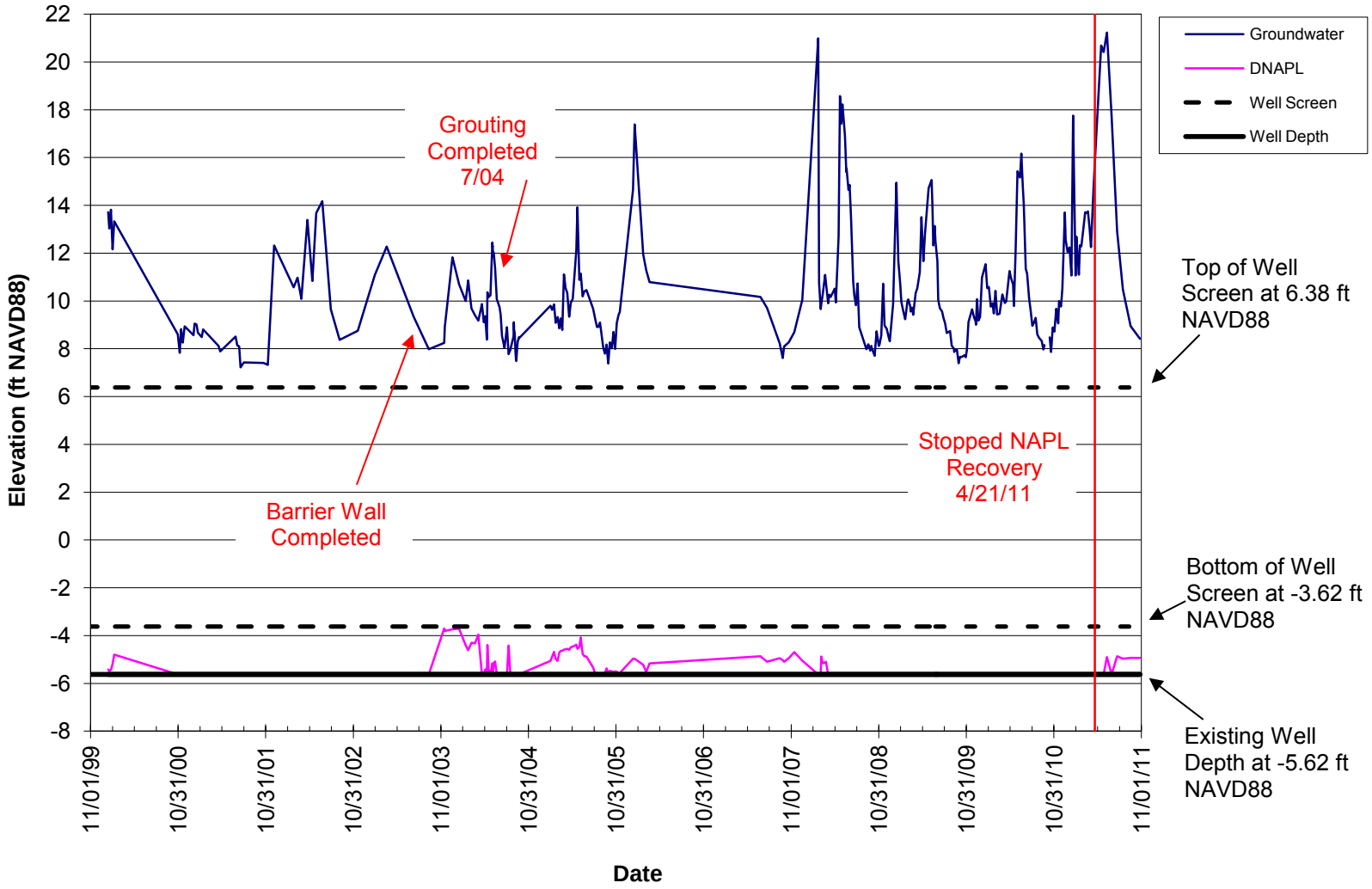

McCormick and Baxter Superfund Site
Portland, Oregon

1999 to 2011 NAPL Thickness Plot for Well EW-9s

5/12

Figure **A-11**

HARTCROWSER

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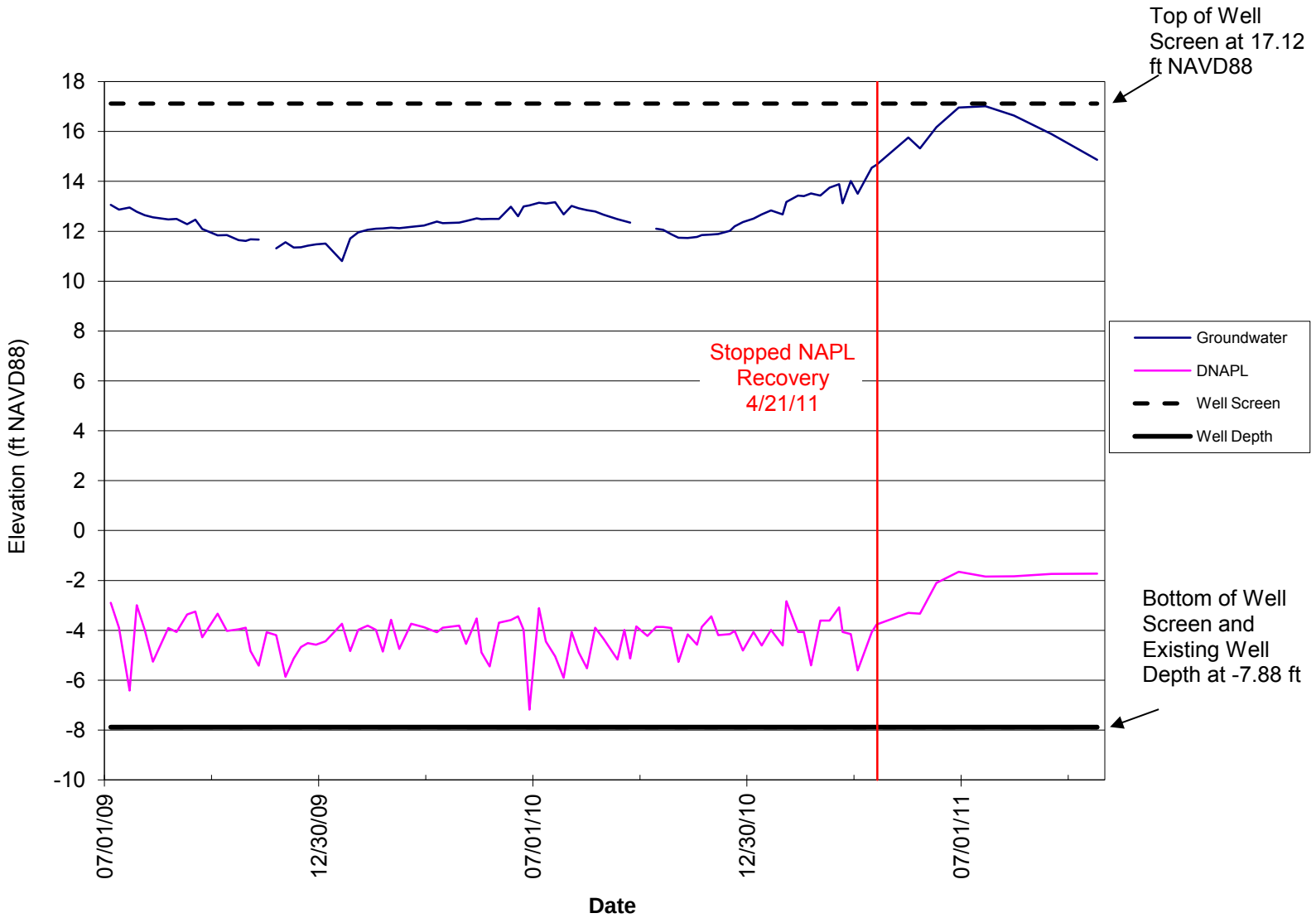

Note: Ground subsidence has been observed in the vicinity of EW-1s and the well casing has sunk over time. The screened interval and total well depth have been referenced to the most recent ground survey from September 2009. Given that the elevations are changing with time, the elevations shown are approximate.

McCormick and Baxter Superfund Site
Portland, Oregon

2009 to 2011 NAPL Thickness Plot for Well EW-1s

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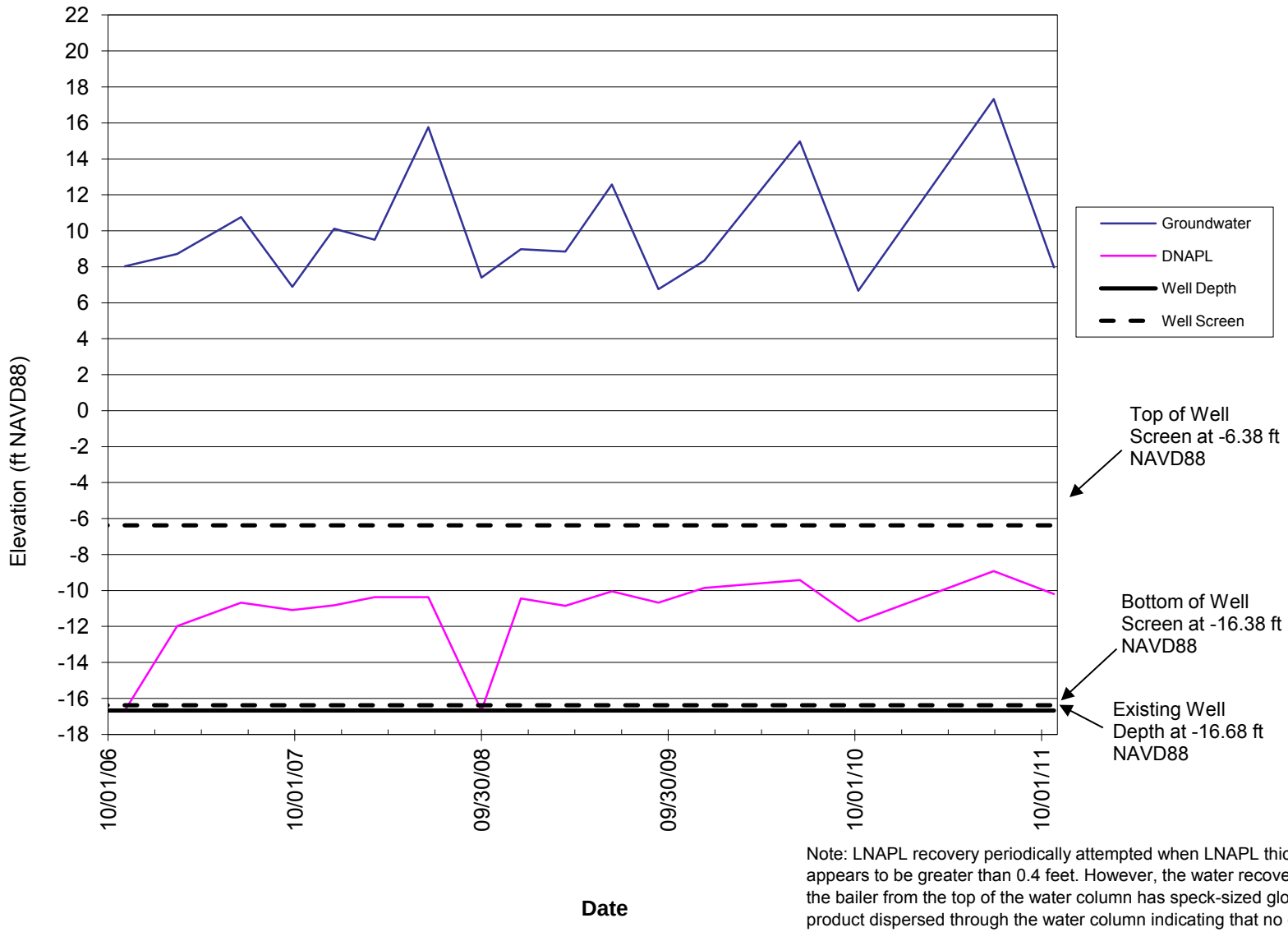
Figure **A-12**

HARTCROWSER

GSI Water Solutions, Inc.



Note: LNAPL recovery periodically attempted when LNAPL thickness appears to be greater than 0.4 feet. However, the water recovered with the bailer from the top of the water column has speck-sized globules of product dispersed through the water column indicating that no discrete layer of product is present.

McCormick and Baxter Superfund Site
Portland, Oregon

2006 to 2011 NAPL Thickness Plot for Well MW-22i

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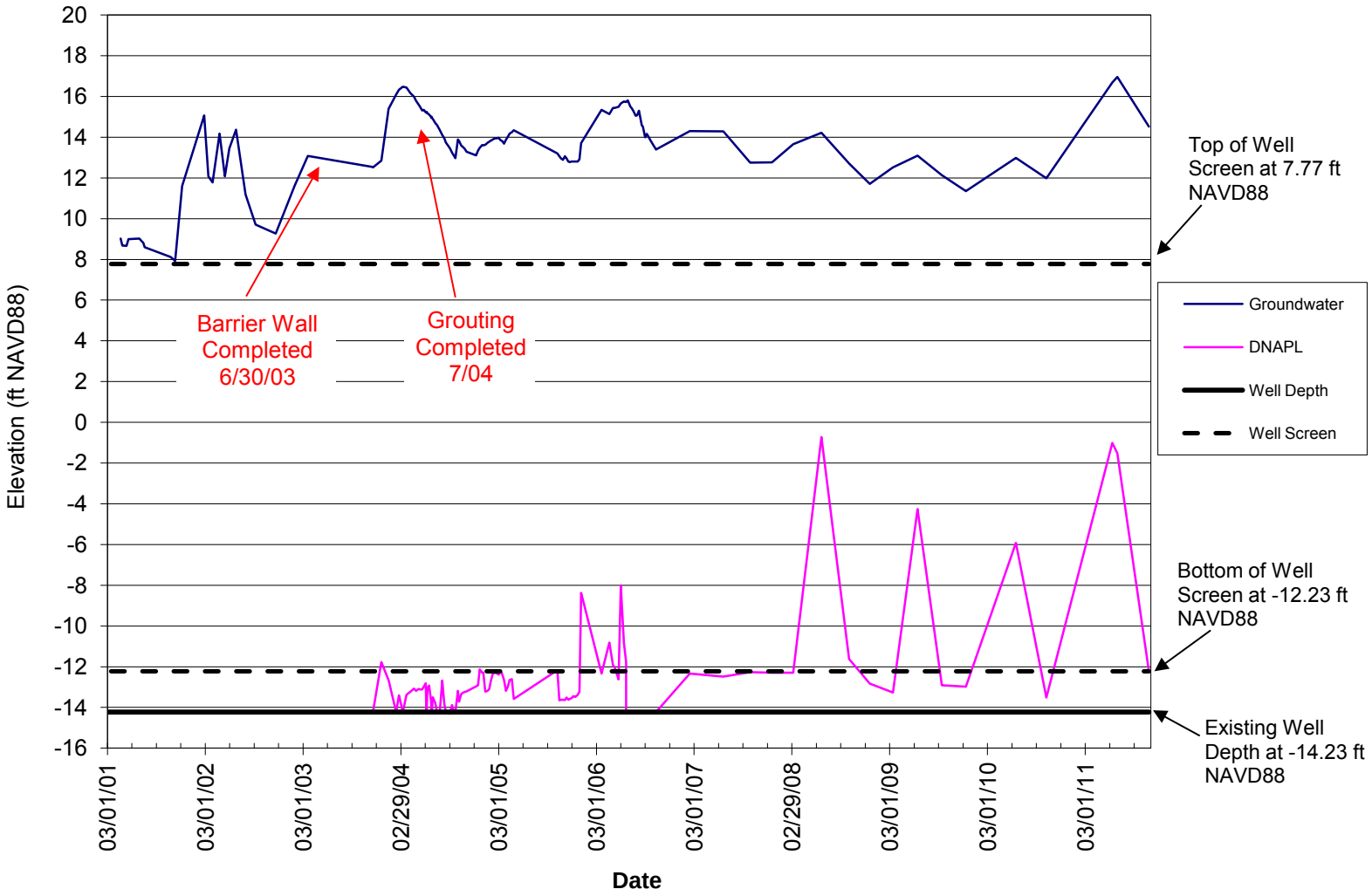
HARTCROWSER

GSI Water Solutions, Inc.

Figure

A-13



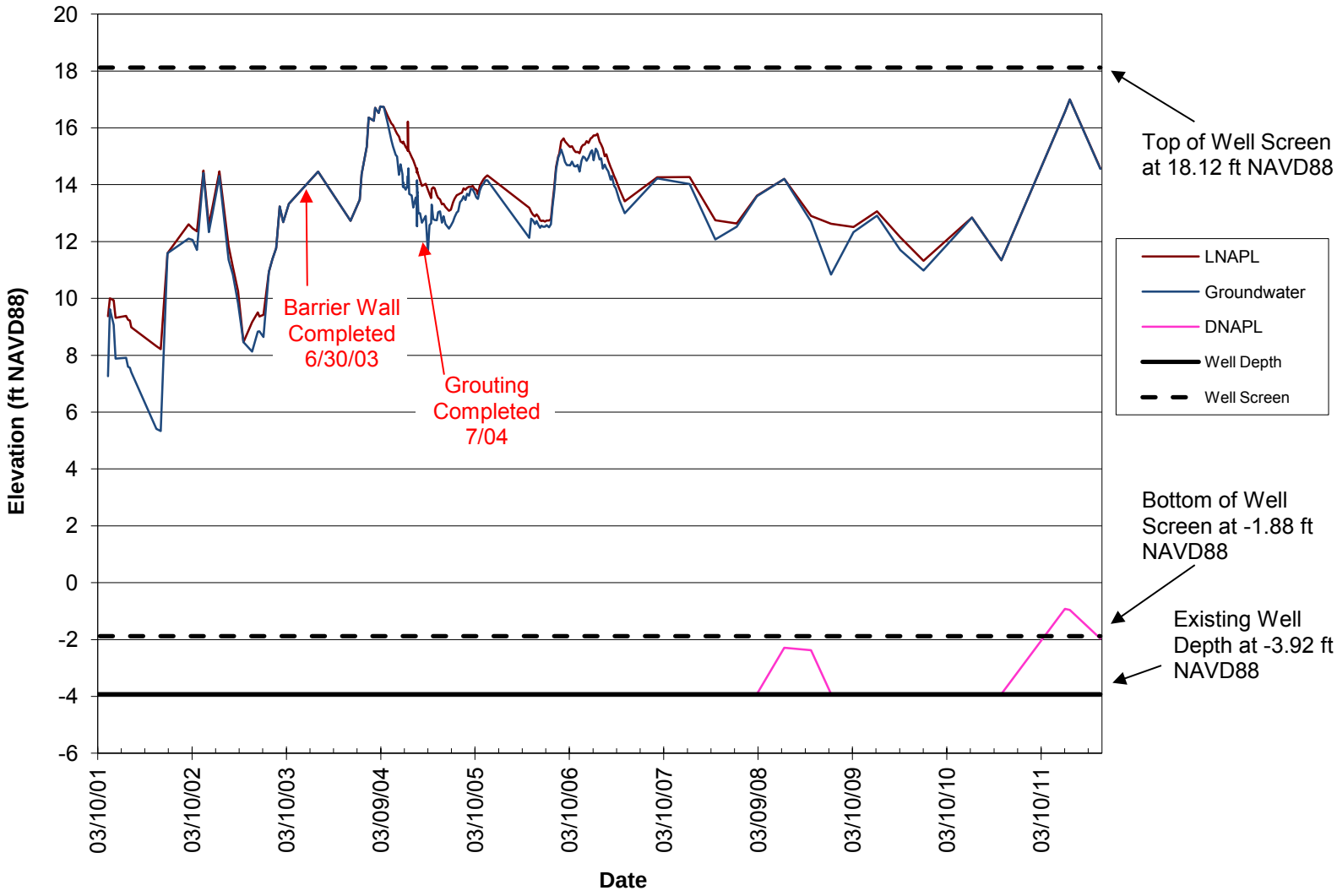
McCormick and Baxter Superfund Site
Portland, Oregon

2001 to 2011 NAPL Thickness Plot for Well EW-8s

5/12

Figure
A-14

HARTCROWSER
GSI Water Solutions, Inc.



McCormick and Baxter Superfund Site
Portland, Oregon

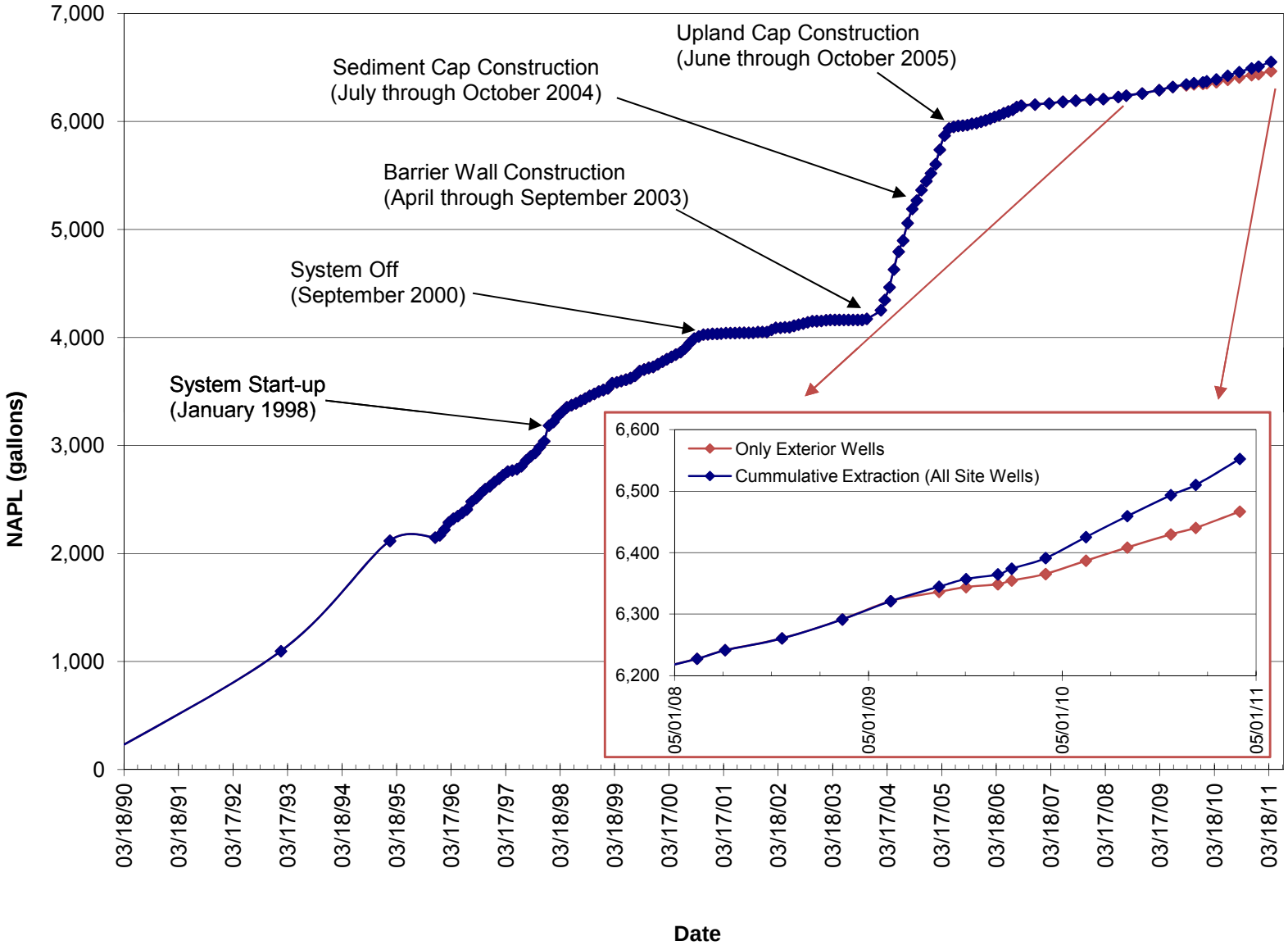
2001 to 2011 NAPL Thickness Plot for Well EW-18s

5/12

Figure **A-15**

HARTCROWSER

GSI Water Solutions, Inc.



McCormick and Baxter Superfund Site
Portland, Oregon

Cumulative NAPL Recovery

5/12

Figure

A-16

HARTCROWSER

GSI Water Solutions, Inc.

LEGEND

- Groundwater Monitoring Wells (Groundwater Elevation)
- Groundwater Elevation Contours (dashed where inferred)
- Willamette River Level During Sampling Event (21.2 feet)
- Subsurface Barrier Wall

NOTES:

1) Elevations shown in NAVD 88
2) Aerial photo taken on September 22, 2006
3) Water levels measured between 10:00 and 13:18
4) Willamette River low tide at 11:30 at 21.2 feet NAVD 88
5) MW-49s field measurement is suspect. Groundwater elevation not used for contouring.

0 200 400

Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

Groundwater Contour Map for June 10, 2011 Sampling Event

5/12

HARTCROWSER GSI Water Solutions, Inc.

Figure **A-17**

File Path: P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project_GIS\Project_mxds\2011_Annual_Report\FigureA-17_GW_Contour_Map_June10_2011.mxd

File Path: P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\Project_GIS\Project_mxds\2011_Annual_Report\FigureA-18_GW_Elevations_Oct25_2011.mxd

LEGEND

- Groundwater Monitoring Wells (Groundwater Elevation)
- Groundwater Elevation Contours (dashed where inferred)
- Willamette River Level During Sampling Event (8.0 feet)
- Subsurface Barrier Wall

NOTES:

1) Elevations shown in NAVD 88
2) Aerial photo taken on September 22, 2006
3) Water levels measured between 9:49 and 12:40
4) Willamette River low tide at 15:00 at 8.0 feet NAVD 88

0 200 400

Scale in feet

McCormick and Baxter Superfund Site
Portland, Oregon

Groundwater Contour Map for October 25, 2011 Sampling Event

5/12

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Figure

A-18

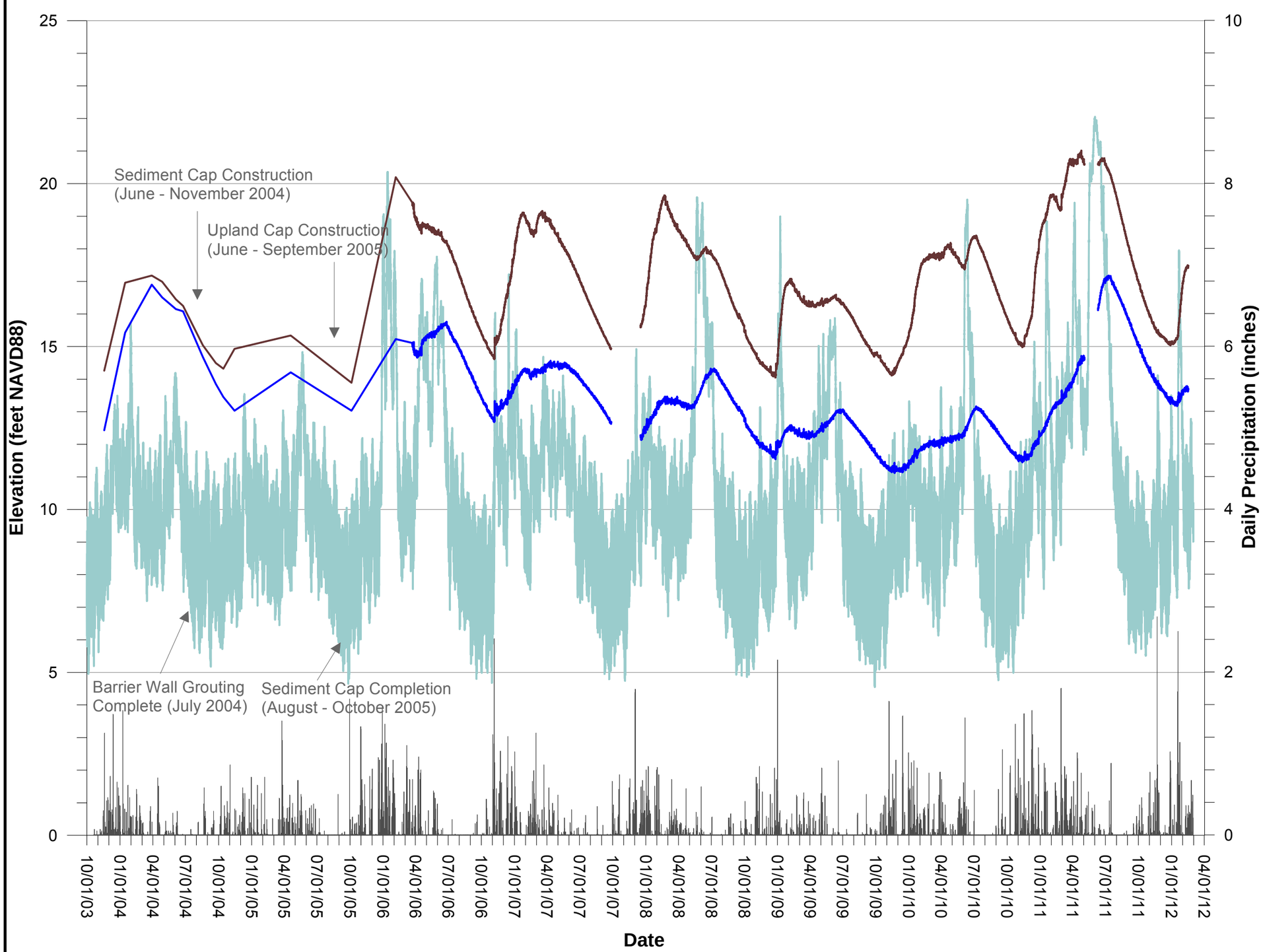


Figure A-19:
Post-Barrier Wall Groundwater Elevations
Monitoring Wells MW-52s and MW-53s
McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- MW-52s (Interior)
- MW-53s (Exterior)
- River
- Precipitation Data

Notes:
MW-52s is located inside the barrier wall and MW-53s is located outside the barrier wall.

Top of Barrier wall (not shown) is about 31 ft NAVD.

Prior to March 23, 2006 water level measurements are manual and intermittent.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

HARTCROWSER

GSI Water Solutions, Inc.

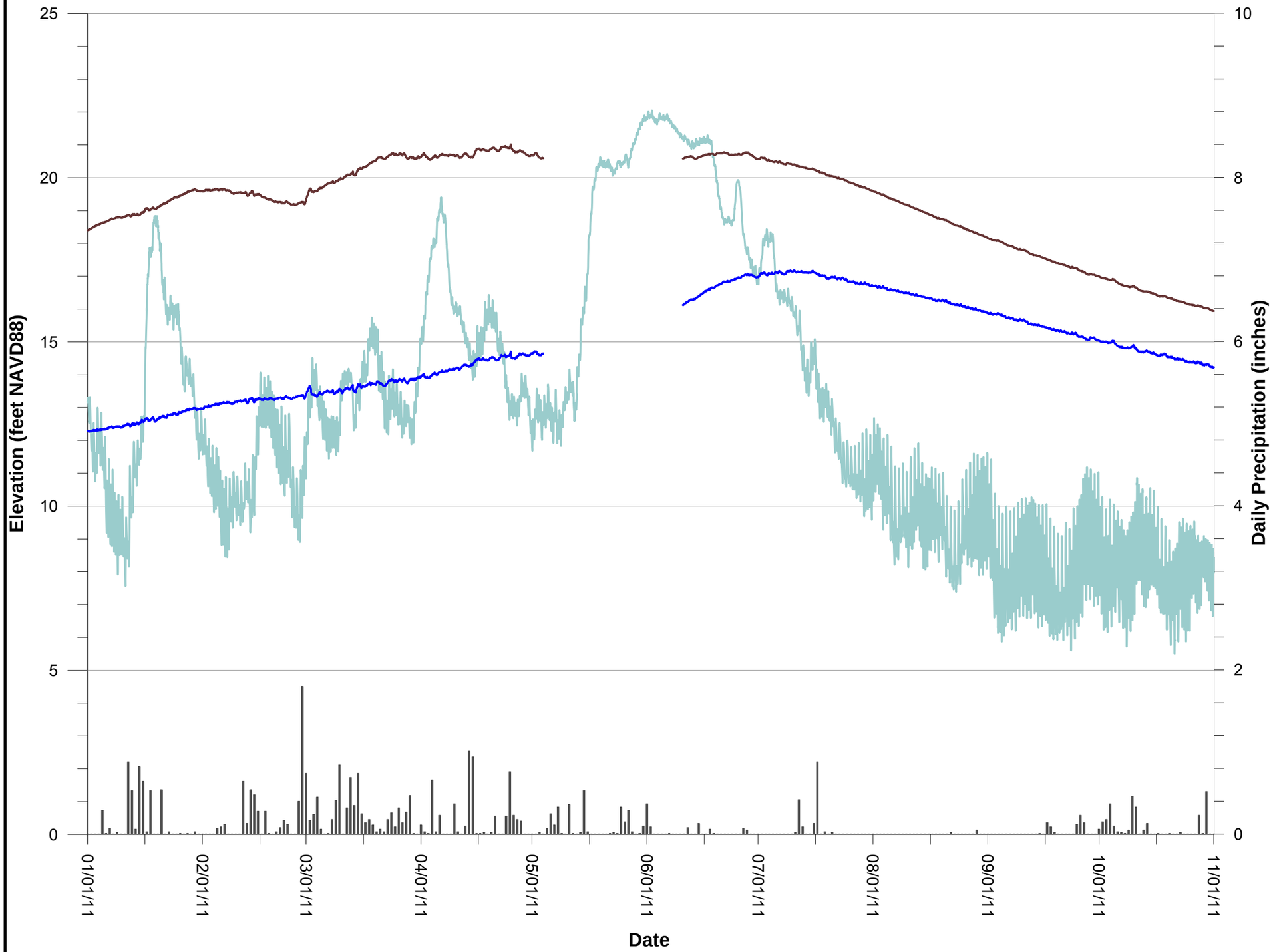


Figure A-20:
2011 Groundwater Elevations
Monitoring Wells MW-52s and MW-53s
McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- MW-52s (Interior)
- MW-53s (Exterior)
- River
- Precipitation Data

Notes:
MW-52s is located inside the barrier wall and MW-53s is located outside the barrier wall.

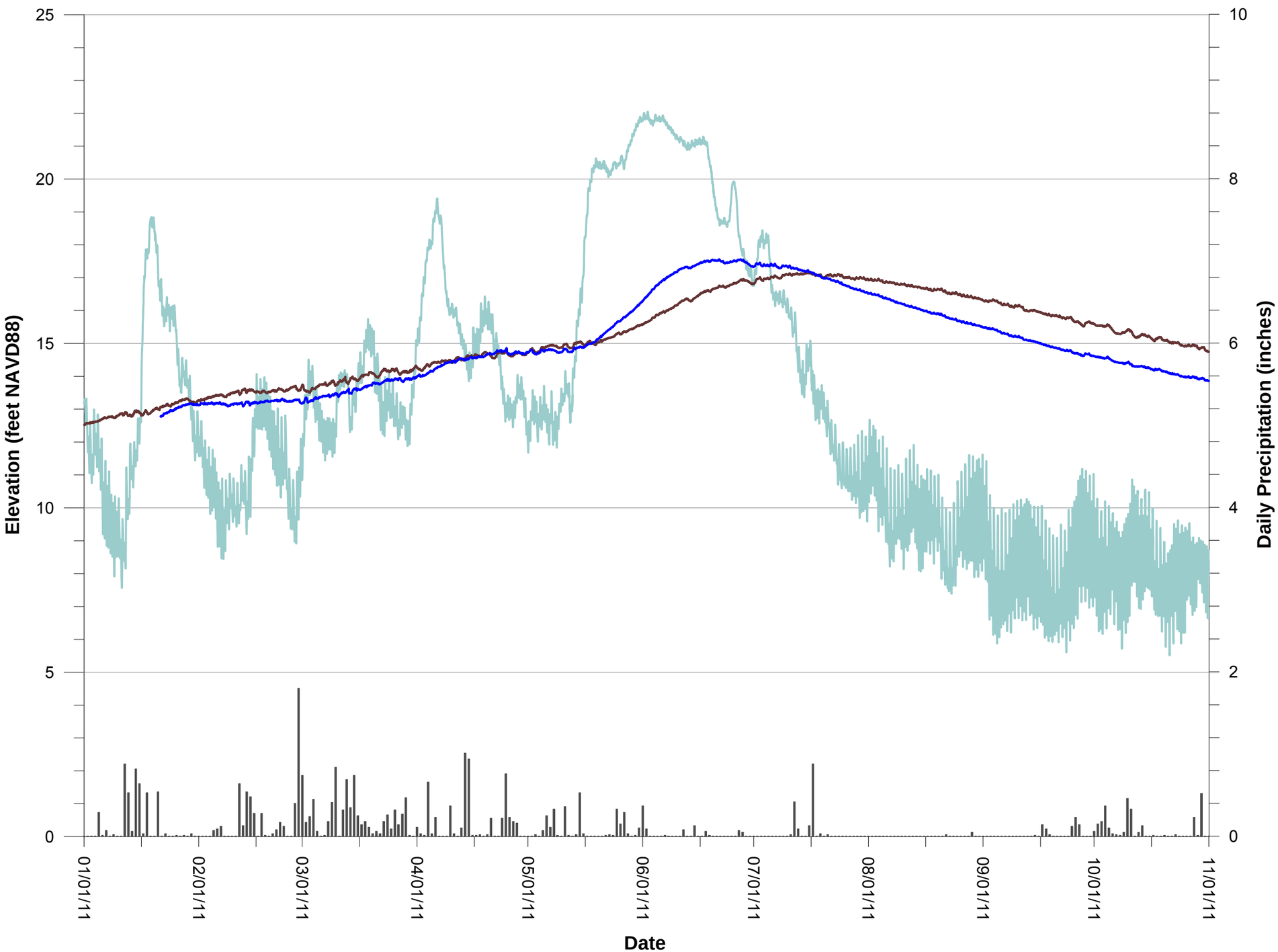
Top of Barrier wall (not shown) is about 31 ft NAVD.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

HARTCROWSER

GSI Water Solutions, Inc.

Figure A-21:
2011 Groundwater Elevations
Monitoring Wells MW-15s and EW-1s
McCormick and Baxter Superfund Site
Portland, OR



LEGEND

- EW-1s (Interior)
- MW-15s (Interior)
- River
- Precipitation Data

Notes:
Monitoring wells EW-1s and MW-15s are located inside the barrier wall.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

HARTCROWSER

GSI Water Solutions, Inc.

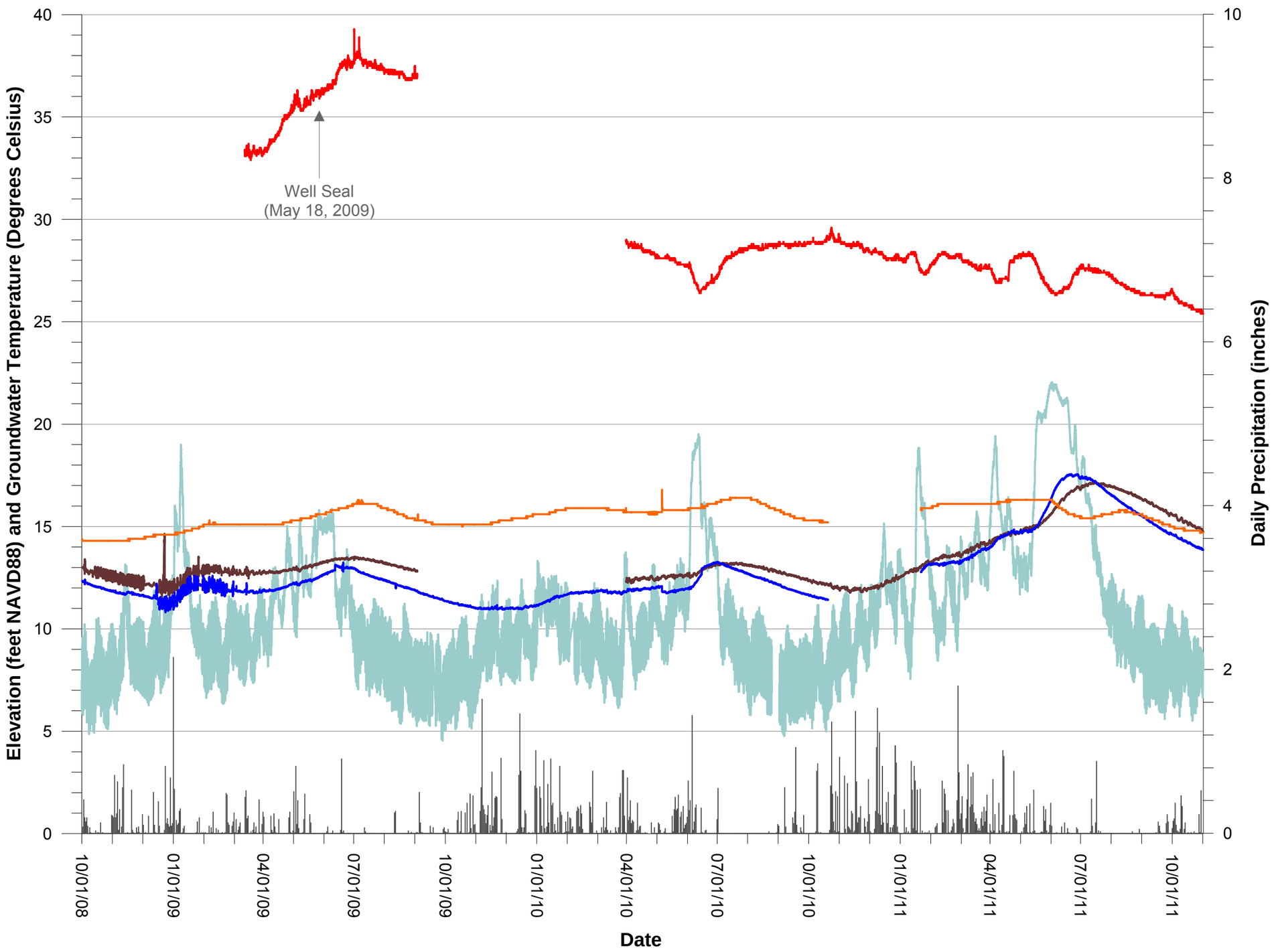


Figure A-22:
2008 to 2011 Groundwater Elevations and Groundwater Temperature Monitoring Wells MW-15s and EW-1s McCormick and Baxter Superfund Site Portland, OR

LEGEND

- EW-1s Temperature
- MW-15s Temperature
- EW-1s Water Elevation
- MW-15s Water Elevation
- River Elevation
- Precipitation Data

Notes:
Monitoring wells EW-1s and MW-15s are located inside the barrier wall.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

Groundwater elevation manually adjusted 0.25 ft up between 17:00 on May 6, 2010 and 14:00 on June 15, 2010 due to apparent displacement from field activities.

HARTCROWSER

GSI Water Solutions, Inc.

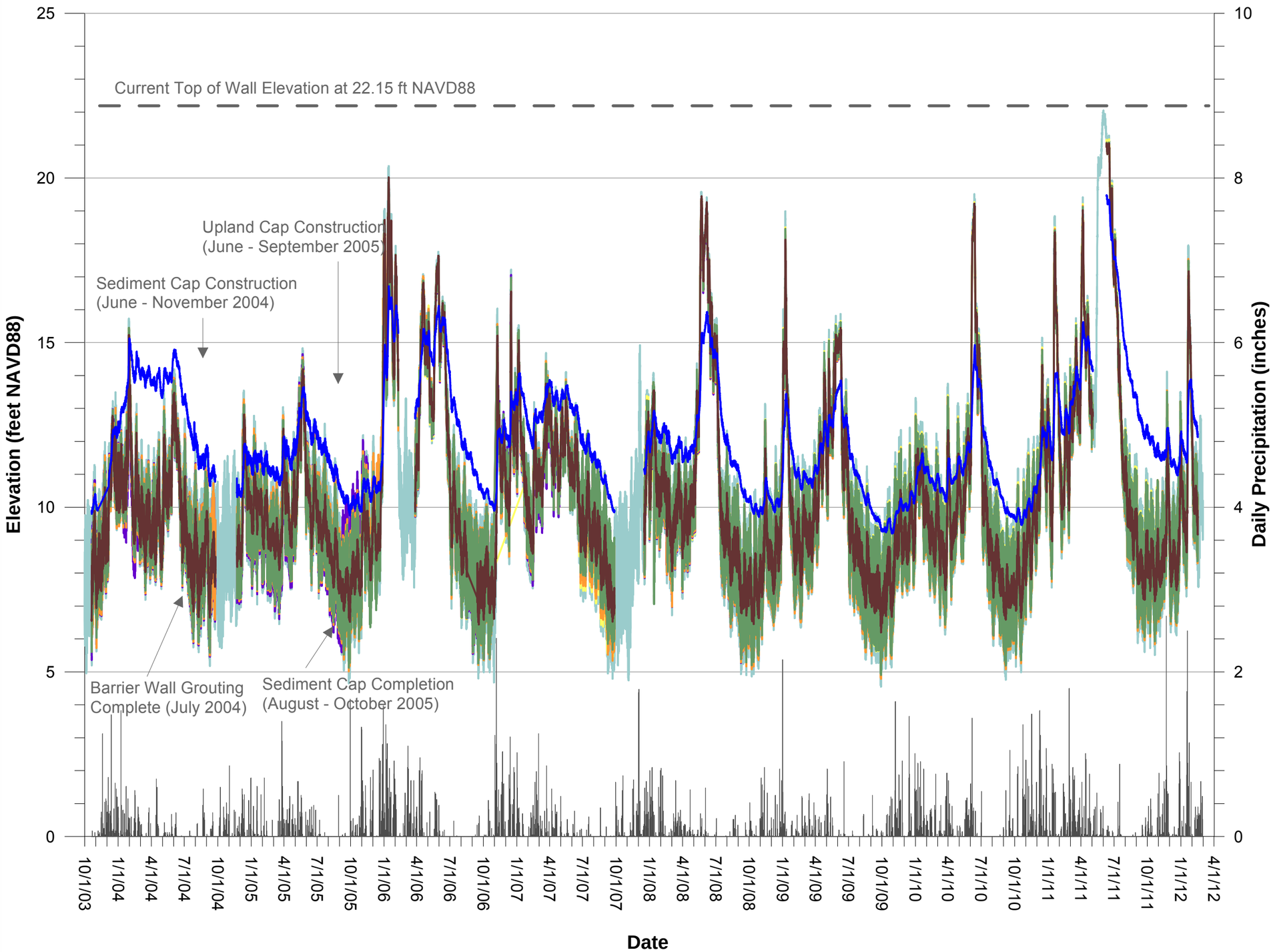


Figure A-23:
Post-Barrier Wall Groundwater Elevations in Monitoring Wells MW-36 and MW-37
McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- MW-36s (Interior)
- MW-36i (Interior)
- MW-36d (Interior)
- MW-37s (Exterior)
- MW-37i (Exterior)
- MW-37d (Exterior)
- River
- Precipitation Data

Notes:
MW-36 wells are located inside the barrier wall and MW-37 wells are located outside the barrier wall.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer that was not collecting accurate pressure readings.

HARTCROWSER

GSI Water Solutions, Inc.

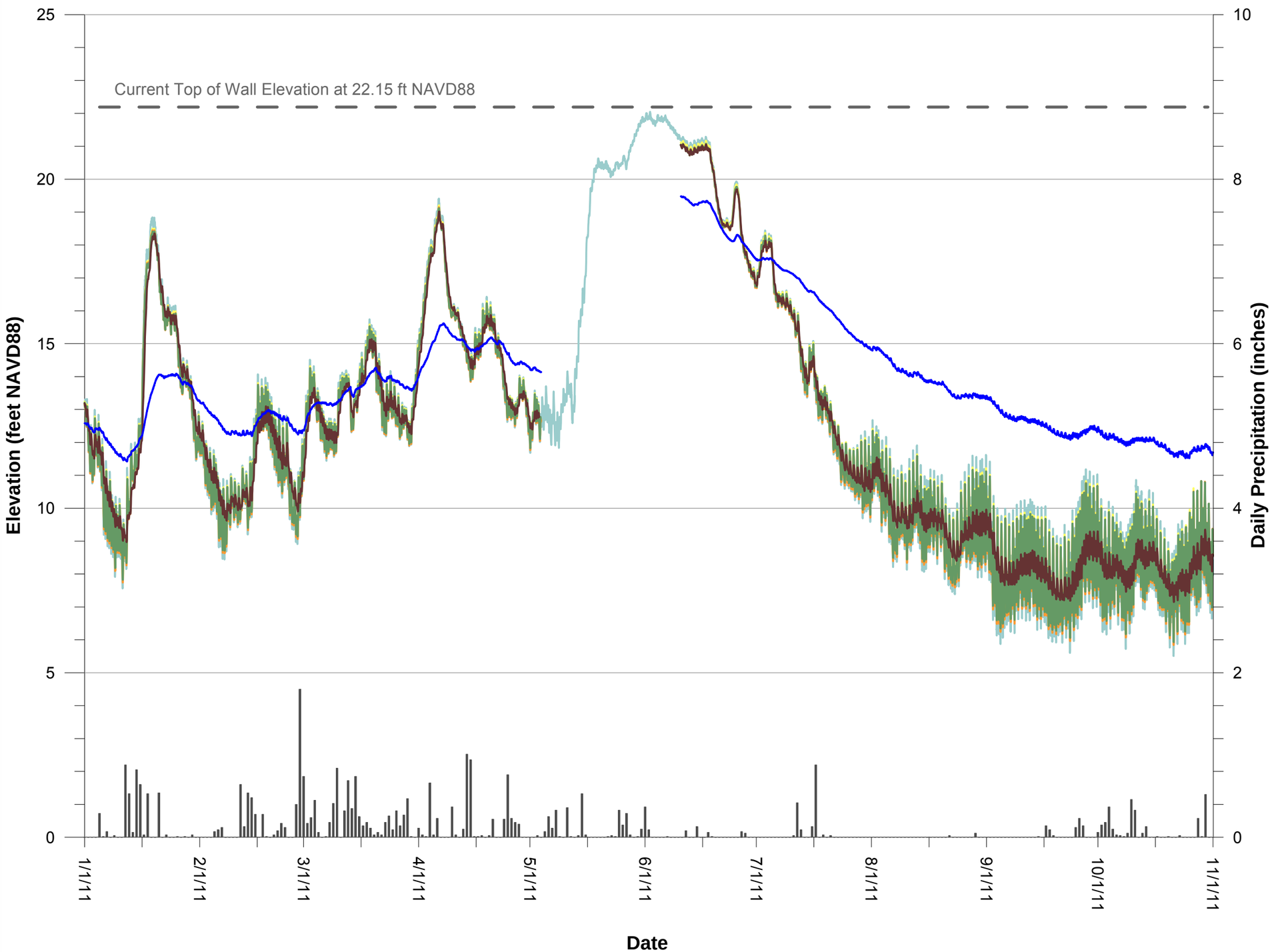


Figure A-24:
2011 Groundwater Elevations
in Monitoring Wells MW-36 and MW-37
McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- MW-36s (Interior)
- MW-36i (Interior)
- MW-36d (Interior)
- MW-37s (Exterior)
- MW-37i (Exterior)
- MW-37d (Exterior)
- River
- Precipitation Data

Notes:
MW-36 wells are located inside the barrier wall and MW-37 wells are located outside the barrier wall.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

HARTCROWSER

GSI Water Solutions, Inc.

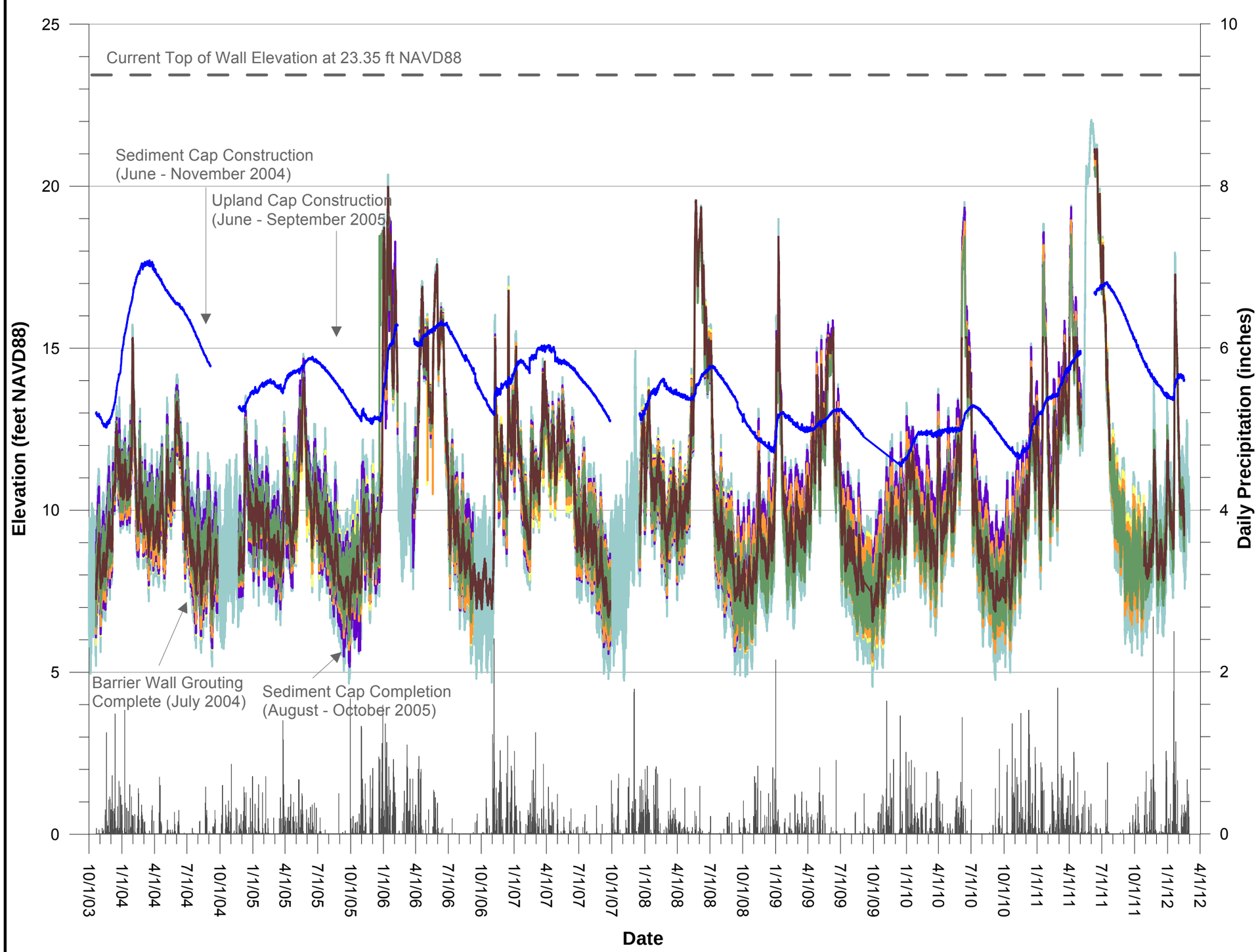


Figure A-25:
Post-Barrier Wall Groundwater Elevations in Monitoring Wells MW-44 and MW-45
McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- MW-44s (Interior)
- MW-44i (Interior)
- MW-44d (Interior)
- MW-45s (Exterior)
- MW-45i (Exterior)
- MW-45d (Exterior)
- River
- Precipitation Data

Notes:
MW-44 well cluster is located inside the barrier wall and MW-45 well cluster is located outside the barrier wall.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

HARTCROWSER

GSI Water Solutions, Inc.

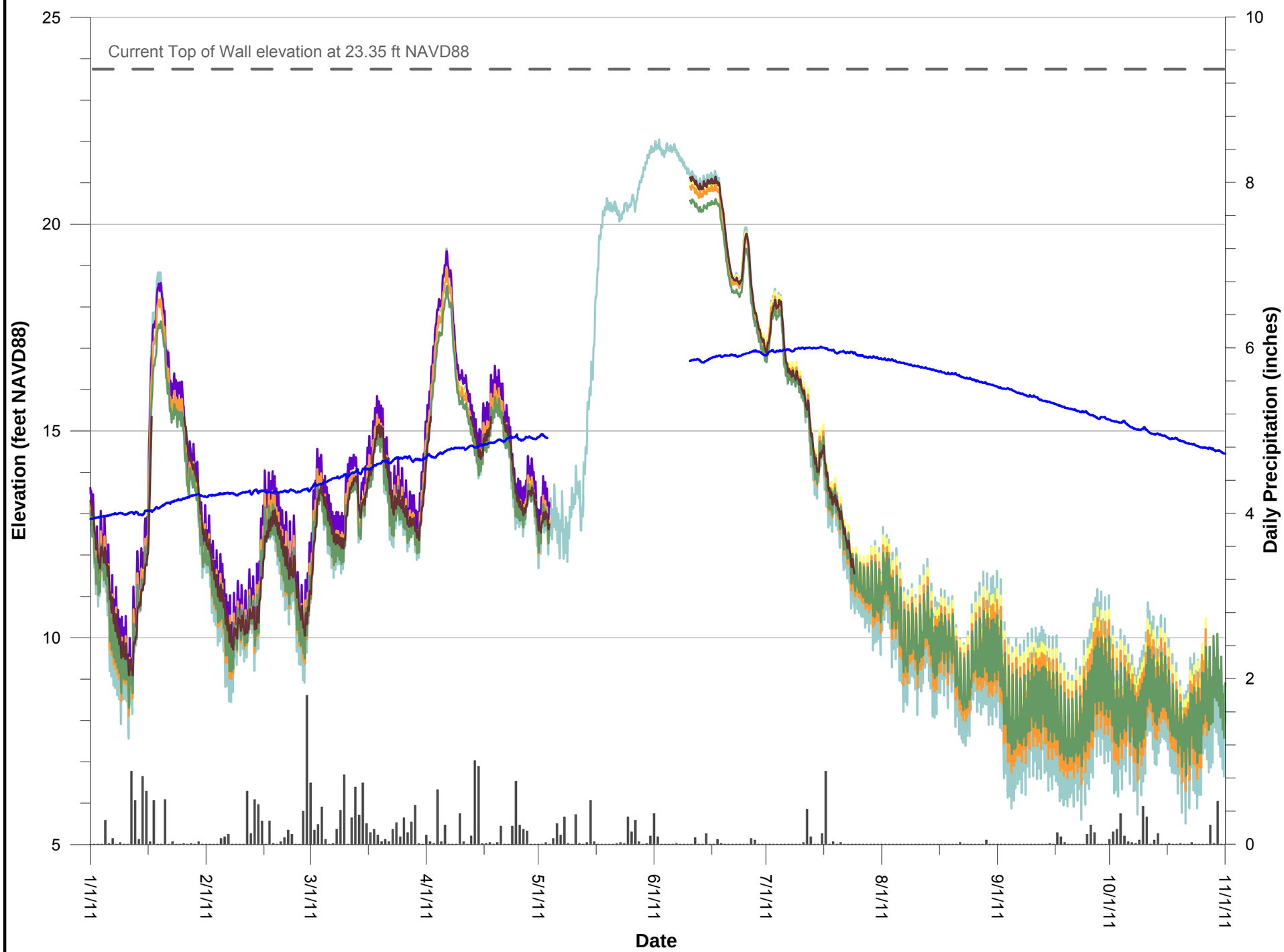


Figure A-26:
2011 Groundwater Elevations in Monitoring Wells MW-44 and MW-45
McCormick and Baxter Superfund Site
Portland, OR

LEGEND

- MW-44s (Interior)
- MW-44i (Interior)
- MW-44d (Interior)
- MW-45s (Exterior)
- MW-45i (Exterior)
- MW-45d (Exterior)
- River
- Precipitation Data

Notes:
MW-44 well cluster is located inside the barrier wall and MW-45 well cluster is located outside the barrier wall.

Breaks in transducer data are the result of removal for calibration, removal for well modification, or a transducer was not collecting accurate pressure readings.

HARTCROWSER

GSI Water Solutions, Inc.

ATTACHMENT A
DNAPL DATA GAP INVESTIGATION REPORT

DNAPL Data Gap Investigation Report
McCormick and Baxter
Superfund Site
Portland, Oregon

Prepared for
Oregon Department of
Environmental Quality

July 11, 2011
15670-05/Task 9

GSI Water Solutions, Inc.

HARTCROWSER

DNAPL Data Gap Investigation Report
McCormick and Baxter
Superfund Site
Portland, Oregon

Prepared for
Oregon Department of
Environmental Quality

July 11, 2011
15670-05/Task 9

Prepared by

GSI Water Solutions, Inc.

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Expires: 12-31-2012

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DNAPL DATA GAP INVESTIGATION REPORT
MCCORMICK AND BAXTER SUPERFUND SITE
PORTLAND, OREGON

1.0 INTRODUCTION

This Dense Nonaqueous Phase Liquid (DNAPL) Investigation Report presents the activities and results for the DNAPL investigation performed at the McCormick and Baxter Superfund Site in Portland, Oregon (Figure 1). The work is being done by the Oregon Department of Environmental Quality (DEQ) and funded through a Cooperative Agreement with the Environmental Protection Agency (EPA). This report was prepared for the DEQ under Task 9 of Task Order 59-08-30.

1.1 Purpose

Since the installation of the barrier wall in 2003, DNAPL has been regularly detected during weekly NAPL gauging and recovery events at three monitoring wells (MW-20i, MW-Ds, and MW-Gs) located outside the barrier wall in the Former Waste Disposal Area (FWDA). The bulk of the DNAPL recovered outside of the barrier wall is recovered from MW-20i. The source of DNAPL recharging MW-20i is poorly understood. The purpose of this investigation was to assess the nature, extent, and source of DNAPL to MW-20i to inform decision-making regarding DNAPL recovery outside the barrier wall.

Specific objectives of this project were to:

- Determine whether there is potentially mobile DNAPL within the backfill of the sewer pipe in the vicinity of MW-20i;
- Determine whether there is a pool of mobile DNAPL overlying the silt that migrates to MW-20i (or elsewhere); and
- Investigate the relationship between the DNAPL observed in monitoring wells MW-20i, MW-Gs, and MW-Ds.

A contingency objective was to determine the hydraulic connection between MW-Gs and MW-20i (i.e. between the zones above and below the silt) with the objective of understanding whether the well seal in MW-20i is compromised should mobile DNAPL be observed overlying the silt layer.

1.2 Scope of Work

To accomplish the above objectives, Hart Crowser and GSI Water Solutions, Inc. (GSI) performed DNAPL investigation activities in general accordance with the scope of work described in the February 2010, Sampling and Analysis Plan (SAP) DNAPL Data Gap Investigation (Hart Crowser/GSI, 2010). However, because mobile DNAPL (free product) was not observed in the continuous soil cores from the 4 borings advanced surrounding MW-20i, the scope of work was reduced through consultation with the DEQ and EPA. Four soil borings surrounding MW-20i were advanced (up to 100 feet below ground surface [bgs]). Continuous sampling was performed with visual logging of the cores.

Prior to drilling, the City of Portland high pressure sewer lines in the vicinity of MW-20i were located by trenching using a high power vacuum system. During trenching, the condition of backfill surrounding the sewer pipes was documented.

Since potentially mobile DNAPL was not observed during trenching or drilling, DNAPL samples were not collected; and thus, testing for specific density, viscosity, water content, and chemical analysis was not completed. Similarly, because potentially mobile DNAPL was not observed in the borings surrounding MW-20i implying that there is not a significant pool of DNAPL recharging MW-20i, EPA and DEQ determined that DNAPL samples collected from MW-20i and MW-Gs did not need to be analyzed and the pumping test to evaluate connectivity between the water-bearing zone(s) was unnecessary.

1.3 Background

The Site is located in Portland, Oregon, on the east bank of the Willamette River at approximately River Mile 7, and encompasses approximately 41 acres of land and an additional 23 acres of capped contaminated river sediments. Currently, the Site is vacant except for a paved parking area, a small shop building, two field office trailers, and associated utilities used to support ongoing remedial action operations and maintenance. The upland portion of the Site is fenced.

DEQ implemented a number of removal measures, including plant demolition, sludge and soil removals, and DNAPL extraction from the shallow and intermediate water-bearing zones. DNAPL is currently being recovered by manual methods. Over 6,000 gallons have been recovered since 1996 (Hart Crowser/GSI, 2011). Implementation of the soil remedy began in March 1999 with the removal of 33,000 tons of highly contaminated soil and debris.

As a component of the groundwater remedy, a fully-encompassing impermeable subsurface barrier wall was installed around 16 acres of the site in 2003. The subsurface barrier wall contains a large portion of the primary source areas of groundwater contamination and minimizes horizontal seepage of DNAPL into the Willamette River. In 2004, a protective cap was placed over areas of contaminated river sediments posing an unacceptable risk to human health and the environment. In 2005, a soil cap was placed over the upland portion of the Site with a Resource Conservation and Recovery Act (RCRA)-style impermeable cap over the upland portion of the Site within the barrier wall. The groundwater remedy consists of groundwater quality monitoring, NAPL recovery, and a subsurface barrier wall surrounding approximately 18 acres within the upland soil cap. The barrier wall was completed in July 2004. The performance standards for the subsurface barrier wall and NAPL recovery are as follows.

- Continue to recover NAPL from outside the subsurface barrier wall until recovery rates become minimal, alternative pumping strategies have been examined and/or field tested with poor results, and remaining NAPL does not pose a threat to the Willamette River and its sediments.
- Maintain contaminant concentrations in shallow, downgradient compliance wells (or sediment porewater) below Alternate Concentration Limits (ACLs) set forth in the Record of Decision (ROD)[1]:
  - Arsenic (III) – 1,000 µg/L;
  - Chromium (III) – 1,000 µg/L;
  - Copper – 1,000 µg/L;
  - Zinc – 1,000 µg/L;
  - PCP – 5,000 µg/L;
  - Total PAHs – 43,000 µg/L; and
  - Dioxins/furans – 0.2 ng/L.
- For reference purposes, groundwater data is compared with current Primary Drinking Water MCLs as follows:

[1] The ROD initially specified site-specific ACLs for the Site. EPA has determined that ACLs are not valid as substitutes for Primary Drinking Water Standard Maximum Contaminant Levels (MCLs) in groundwater. Invalidation of ACLs also affects whether the groundwater RAOs derived from the provisions in CERCLA for using ACLs remain valid for the Site. As a result of this determination, the DEQ and EPA anticipate that: 1) groundwater standards for the Site will be established following a rigorous analysis of Site conditions and all relevant data; and 2) (assuming MCLs cannot be met) the application of a waiver pursuant to Section 122(d)(4) of CERCLA for MCLs to comply with the threshold criterion (meeting ARARs) for all remedies implemented pursuant to any final CERCLA ROD. Issues associated with use of ACLs at this Site are further discussed in Section VIII and IX of the Second Five-Year Review Report.

- Arsenic – 0.01 mg/L;
- Chromium – 0.1 mg/L;
- Copper – 1.30 mg/L;
- Zinc – 5.00 mg/L;
- PCP – 1 µg/L; and
- Benz(a)pyrene – 0.2 µg/L.

- Minimize the transport of NAPL and communication of groundwater zones across the subsurface barrier wall.
- Minimize further vertical migration of DNAPL to the deep groundwater aquifer.
- Minimize visible discharge of DNAPL to the Willamette River.
- Maintain contaminant concentrations in the Willamette River below background concentrations or less than the Sediment Cap performance standards for surface water.

2.0 SUMMARY OF HISTORIC NAPL RECOVERY AND INVESTIGATIONS

The Former Waste Disposal Area (FWDA) contains both light nonaqueous phase liquid (LNAPL) and DNAPL that mainly consists of creosote and carrier oil compounds. The origins of the non-aqueous phase liquid (NAPL) are the former ponds where waste oils, stormwater from system pits, and other liquid wastes were disposed (GSI, 2007). The FWDA is located in the northwestern portion of the Site where contaminant migration was partially contained behind the subsurface barrier wall, which consists of sheet pile that extends approximately 88 feet bgs. The subsurface barrier wall does not encapsulate the entire FWDA source area due to a high pressure sewer line that parallels the Burlington Northern Rail Line. Figure 2 shows the NAPL investigation area along with other site features such as the location of the monitoring wells and the barrier wall.

Since the installation of the barrier wall in 2003, DNAPL has been regularly detected during weekly NAPL gauging and recovery events at three FWDA monitoring wells (MW-20i, MW-Ds, and MW-Gs) outside the barrier wall.

Approximately 7 to 8 gallons of NAPL are manually recovered each month from outside the barrier wall and the recovery rate has remained consistent over the past 4 years. Of the three wells where NAPL is regularly observed,

the bulk (75%) of the DNAPL outside the barrier wall has been recovered from MW-20i with small amounts extracted from MW-Ds (~12%) and MW-Gs (~13%). Wells MW-Ds and MW-Gs often take several weeks to recover (i.e. for NAPL to enter the well to a thickness greater than 1.5 feet) while MW-20i recovers within a few days. When allowed to fully recover, the thickness of DNAPL in each of these wells has remained consistent over time with no obvious decrease in thickness suggesting a potential ongoing source.

Monitoring well MW-20i was installed in 1991 and is screened in the intermediate water-bearing zone (from 49.7 to 69.7 feet [ft] below ground surface [bgs]). The well log indicates that creosote-like odors and oily sheen were observed in soil samples from 21 to 88 ft bgs. Samples collected from 23 to 25 ft bgs and 82 to 88 ft bgs were saturated with NAPL. Substantial accumulations of NAPL (maximum of 21.6 feet in 1991) were observed in this well until 2001 when it was no longer observed in the well. After the barrier wall was completed in 2003, more than 10 feet of DNAPL quickly returned to the well. Although DNAPL is recovered weekly from MW-20i, DNAPL thicknesses in the well have been relatively steady since 2006. The maximum DNAPL thickness in MW-Gs was 14.85 feet in 1991 and in MW-Ds was 5.25 feet in 1987. DNAPL was no longer present in either of these wells by 2001, similar to MW-20i, until the barrier wall was installed and DNAPL re-entered the wells. Since then, the DNAPL thickness in these wells has remained consistent at approximately 1.5 ft.

Based on testing from 2006, the physical properties of the DNAPL in MW-20i differ from those observed in MW-Ds. Laboratory analysis on the extracted DNAPL indicate that the specific gravity in this MW-20i is much closer to that of water (1.0069 AT 59ºC) than product extracted from MW-Ds (1.0399 AT 59ºC) (GSI, 2007). The NAPL density in both MW-Ds and MW-20i indicate a mixture of creosote and diesel, which is consistent with the FWDA source which consisted of waste oil that included carrier oils such as diesel, in addition to creosote.

As mentioned previously, the primary objective of this NAPL investigation was to better understand the source(s) of the DNAPL to monitoring well MW-20i and associated migration pathway(s). Potential sources identified in the SAP include a compromised well seal on MW-20i, discontinuities in the silt layer approximately 24 to 40 feet bgs, or potential NAPL accumulation along the fill surrounding the high pressure sewer line that was thought to be located as close as 2 feet from MW-20i. In attempt to better understand the distribution of NAPL in the subsurface, fence diagrams showing water and NAPL elevations were prepared for the SAP.

3.0 FIELD INVESTIGATION

From March 10 through April 15, 2011, investigation activities were performed to assess the nature, extent, and source of DNAPL in the vicinity of MW-20i. Activities included trenching and pot holing to locate and observe backfill surrounding the COP high pressure sewer lines and collecting continuous soil cores to visually inspect subsurface materials for evidence of free product. The discussion below summarizes field activities. Please refer to Appendix A for a detailed discussion of the field investigation procedures. Representative photographs of the field activities are included in Appendix B.

3.1 Preparatory Activities

Prior to completing field activities at the site, certain activities were performed. These activities are discussed below.

Site Health and Safety Plan. We prepared a site-specific Health and Safety Plan (HSP) for the proposed investigation activities. The HSP was prepared in general accordance with the Occupational Safety and Health Act and Oregon Administrative Rules. The Hart Crowser/GSI field representatives had a copy of the HSP on the site and conducted a safety briefing with the drillers prior to the initiation of the field activities.

Subcontractor Solicitation. The investigation activities included private utility locating, trenching, pot holing, drilling, and investigation-derived waste (IDW) handling and disposal. All contractors were selected through a competitive solicitation process and are under subcontract to Hart Crowser. The successful bidders included Locates Down Under of Portland, Oregon (utility locating); Clearwater Environmental of Wilsonville, Oregon (trenching); Bravo Environmental of Portland, Oregon (pot holing); Cascade Drilling of Clackamas, Oregon (drillers); and WasteXpress of Portland, Oregon (waste disposal).

Underground Utility Location. Hart Crowser contacted the Oregon Utility Notification Center before mobilizing to the site, who in turn notified the various utilities in the area to mark any underground installations in the vicinity of the site. We also directed Locates Down Under to mark utilities at and near the site. Due to the depth of the COP sewer lines (greater then 10 feet depth) trenching and pot holing was necessary to locate the lines. The COP was notified prior to any subsurface excavations and a representative was on-site to observe the trenching and pot holing activities near their high-pressure sewer line.

3.2 Sewer Line Locating

According to COP as-built drawings and previous sewer line trenching at the site, the 20- and 30-inch diameter high-pressure sanitary sewer lines were expected to be at a depth of 10 to 12 feet below the site.

On March 10 and 17, 2011, trenches were completed by Clearwater Environmental of Portland Oregon, to locate and inspect the backfill material surrounding the sewer lines. The general trenching area is shown on Figure 2. Hart Crowser and COP representatives were present to observe and document the trenching activities and subsurface conditions encountered. On March 10, 2011, Clearwater used a CAT 420 D backhoe to trench to 15 feet bgs to locate the sewer line, but loose sands prevented Clearwater from digging further as site features (e.g., MW-20i) were becoming exposed. On March 17, 2011, Clearwater used CAT 320 CLU excavator with 8-foot shoring to trench to 18 feet bgs, but efforts were abandoned as the contractor was worried that unstable shoring (due to loose sands) would damage the high pressure sewer lines. Contaminated soil, groundwater, and/or NAPL were not encountered during trenching activities. Soils encountered during trenching generally consisted of brown, moist, silty sand with no staining, sheen, or odors. No soil or groundwater samples were collected for laboratory analysis.

From April 6 through 11, 2011, eleven pot holes were completed by Bravo Environmental of Portland, Oregon, using a CAT 305 CR mini-excavator and positive displacement Vactor Hydro-Excavator truck to locate and inspect the backfill material surrounding the sewer lines (Figure 2). Latitude and longitude coordinates for all pot hole locations were obtained using a Trimble GeoXT handheld Global Positioning System (GPS). Hart Crowser and COP representatives were present to observe and document the pot holing activities and subsurface conditions encountered.

Vacuum pot holing located the sewer lines upland approximately 100 feet east of MW-20i at 12 feet bgs. Subsequent pot holing followed the sewer lines toward MW-20i revealing a declining elevation as the sewer lines descend west towards MW-20i and the Willamette River. Both sewer lines were observed at about 18 feet depth located on either side of MW-20i. Sewer line pot hole locations and approximate elevations are shown on Figure 2. No backfill or contaminated media was observed surrounding either sewer line. One pot hole was completed to 25 feet bgs between MW-20i and MW-60d to clear the area for drilling. Groundwater with visible sheen was encountered at 25 feet bgs. Contaminated soil, groundwater, and/or free product was not encountered in any of the other pot hole locations. Soils

encountered during pot hole activities generally consisted of brown, moist, silty sand with no staining, sheen, or odors. No soil or groundwater samples were collected for laboratory analysis.

3.3 Investigative Soil Borings and Observations

From April 12 through 15, 2011, a total of four soil borings were completed adjacent to MW-20i to assess subsurface soil and groundwater conditions and search for evidence of contamination. The soil borings were advanced using a track mounted compact roto sonic drill rig (CRS-17-C) and were completed in accordance with OWRD regulations by Cascade Drilling, an Oregon-licensed driller under subcontract to Hart Crowser. Hart Crowser, GSI, DEQ, and EPA representatives were present to observe and document the sonic boring activities and subsurface conditions encountered. Soil boring logs are included in Appendix A. Photographs 10 through 13 (Appendix B) show the sonic drill rig at each soil boring location.

Locations. Figure 2 shows locations of the four soil borings. These locations were selected in conjunction with EPA and DEQ. Latitude and longitude coordinates for all boring locations were obtained using a Trimble GeoXT handheld GPS. Descriptions of the locations are as follows:

- Three sonic borings (SC0211, SC0111, and SC0311) were completed approximately 15 feet to the west, north, and east of MW-20i to determine the source and extent of DNAPL in the direct vicinity of MW-20i.
- One sonic boring (SC0411) was completed near former 2006 boring SC3604 where DNAPL was observed to determine if DNAPL continues to be present east (upgradient) of MW-20i.

Sonic borings were not completed further north and west of MW-20i along the Burlington Northern right of way and further east near EW-2s, as no free product or heavy sheens were observed in borings SC0111, SC0211, and SC0311.

Exploration Depth and Soil Sampling. All explorations were completed using a track-mounted sonic drill rig. The sampling procedure involved driving the sonic drill stem in 5 foot increments, removing it from the hole, and placing the sample core into clear plastic sleeves (typically two approximately 2.5 foot long bags). The sampler was then prepared for driving the next 5-foot-depth interval (or portion thereof). Continuous soil cores were collected and systematically logged and inspected over the full depth of the exploration. Boring SC0111 was completed to 110 feet bgs, SC0211 to 105 feet bgs, SC0311 to 80 feet

bgs, and SC0411 to 35 feet bgs. Exploration logs are presented in Appendix A.

The first soil boring (SC0211) was initially advanced using an 8-inch diameter sonic coring device with the intent of being able to telescope the boring down to 6-inch should potentially mobile NAPL be observed above the silt layer. Telescoping (step-down) was not necessary. However, the drillers only had a limited amount of 8-inch pipe; therefore, the entire drill stem was removed and the hole was advanced deeper using a 6-inch drill stem from 31 ft to 110 feet, the total depth explored. The other three borings were advanced using a 6-inch diameter core tube.

Each core was visually examined to determine whether there is NAPL in the sample and note soil features using the Unified Soil Classification System (USCS) in general accordance with ASTM 2487 and ASTM 2488. In addition to the physical soil description, other distinguishing features such as sedimentary structures, vegetation, debris, and evidence of biological activity were documented on the soil boring log (Appendix A). Photographs documenting representative soil types and visual evidence of contamination are provided in Appendix B.

Field Screening. Soil obtained from the soil cores was field screened using a sheen test (a visual test to assess if sheen is produced on water by the soil). Air monitoring for volatiles and flammables was also conducted using a photoionization (PID) detector and flame ionization detector (FID). Field screening results and visual and olfactory indications of contamination are included in soil boring logs presented in Appendix A.

NAPL Sampling. As only moderate sheen and limited staining was observed in the soil cores, no discrete DNAPL sampling was performed.

Abandonment. After sampling activities were completed and the soil borings were located by obtaining latitude and longitude coordinates using a Trimble GeoXT handheld GPS, each boring was abandoned in accordance with OWRD regulations by using a tremie pipe to completely fill the boring with a cement-bentonite grout. The surface was then finished to match the surrounding surface and areas of disturbed vegetation were reseeded with native grass seed.

Decontamination. To prevent cross contamination between investigative soil borings, clean dedicated sampling equipment (e.g., disposable gloves, groundwater sampling tubing) was used for each boring and discarded after use. Cleaning of non-disposable items (e.g., sample knife) consisted of

washing in a detergent solution (phosphate free), rinsing with deionized water, and a final rinse with methanol. Sonic drilling equipment was decontaminated using a high-pressure washer before and after each boring. Decontamination water was collected and handled as discussed below.

IDW Management. IDW consisted of the bagged soil cores, decontamination water, and personal protective equipment (PPE). IDW was segregated and stored temporarily in properly labeled Department of Transportation approved 55-gallon drums (soil and water) or hazardous waste totes (PPE) pending disposal.

3.4 Subsurface Geology and NAPL Distribution

Based on the soil borings, the primary geologic substrate in the FWDA is sand that varies in color from brownish to grayish with depth. The sand is typically well-graded (non-uniform) near the surface and poorly graded (uniform) with depth. The soil boring logs are contained in Appendix A and representative photographs of the subsurface material are provided as photos 14 through 19 in Appendix B. Occasional gravel is present near the surface and a distinct layer of well-graded gravel was observed in SC0411 (Photograph 16). A layer of silty sand, ranging in thickness from 0.5 to 4 feet thick, was encountered in SC0111, SC0211, and SC0311 at the anticipated depth of approximately 20 feet below ground surface and at various intervals up to 43 feet bgs. Two thin (~0.5 foot) silt layers were also encountered in SCO411 at depths of 19 and 21.5 feet bgs (Photograph 17).

Although sheens and/or staining were observed at various depths in all four soil borings, none of the observed product was appeared to be mobile. Much of the residual product is bound to the soil particles and expressed as either thin layers or stringers of staining and various levels of sheen and/or odor. Some of the staining was observed overlying the less permeable fine-grained soil layers (Photograph 17 and 18) while others were observed in the middle of relatively homogeneous sand. SC0111 had no visible evidence of contamination apart from a light sheen (with no associated staining) between 101 feet and 104 feet bgs. The greatest extent of contamination was observed in SC0211, which contained moderate sheen and dark staining from approximately 35 to 26 feet and 91 to 98 feet bgs (Photograph 19). Light sheen, light staining, and/or an odor was observed at approximate depths of 27 feet, 53 to 54.5 feet, 85 to 90 feet, and 98 feet to the total depth explored (105 feet). Light to moderate sheen and staining was observed in SC0311 and SC0411 at depths ranging from approximately 18.5 to 40 feet, with the level of contamination decreasing with depth. No evidence of

contamination was observed in the lower portion of those two borings or throughout the majority of the SC0111 and SC0211.

4.0 NAPL DISTRIBUTION AND MOBILITY INTERPRETATION

Based on the data gathered from the investigation activities, there appears to be primarily two zones of residual product in the DNAPL investigation area with evidence of historic NAPL pathways (NAPL stringers) evidenced by thin layers of residual creosote staining. A conceptual fence diagram of this area has been prepared with information from the new and existing soil borings and is included as Figure 5. As shown on the diagram a relatively shallow (approximately 20 to 40 foot) zone of residual product was observed in SC0311 and SC0411. This is consistent with the 'smear zone' observed in the well logs from nearby monitoring wells MW-Gs, MW-60d, and SC3604. Currently, product observed in this 'smear zone' is residual and non-mobile.

A deeper zone of potentially mobile DNAPL was observed when MW-20i was installed in January of 1990. At that time, soil between 82 and 88 feet bgs were described as "saturated with a creosote-like liquid." This product was not observed in other deeper wells (such as MW-60d) in the vicinity of the FWDA. Residual product was observed in boring SC0211 at a similar depth (91 to 98 feet bgs).

In 2004, seven soil boring were advanced in the FWDA area (three inside the barrier wall and 4 outside the barrier wall, SC3604-SC3904) to assess the extent and distribution of DNAPL contamination and collect soil cores for NAPL mobility. As documented in Section 5 of the Post Remedial Action Conceptual Site Model for NAPL Transport report (GSI, 2007), the current boring log data showing thin layers with moderate sheen concurs with the conclusion that DNAPL in the FWDA is not present as a large pool in the subsurface. In the 2004 investigation, thin layers with slight to moderate sheen and odors were observed in isolated areas where DNAPL is observed. In 2004, NAPL was observed in the smear zone (at the water table) in the three of the four borings (SC36-04, SC3704, and SC3904) completed outside the barrier wall and NAPL-saturated sand was observed in SC3904 at 36-37.5 feet bgs directly above a confining silt layer. In the current investigation, SC0411 was advanced adjacent to SC3604, the only location where NAPL mobility testing in 2004 showed mobile NAPL. The initial NAPL saturation was 15.8 % which reduced to 7.3% after centrifugation for an hour (ASTM D425M Dean Stark NAPL Mobility testing method). There was no evidence of potentially mobile NAPL in SC0411, suggesting that mobile NAPL in the area of MW-20i has further diminished in the last 7 years.

In 2005, MW-60d was installed adjacent to MW-20i to better understand the distribution of NAPL in the subsurface in the vicinity of MW-20i. While there was stained soil in the smear zone, no zones of potentially mobile NAPL were observed between the smear zone and the total depth of 105 feet bgs, and no NAPL has entered the well. The well is screened from 80 to 100 feet bgs in the zone where NAPL saturated soils were observed in MW-20i when drilled in 1991. This also shows that NAPL has migrated such that stringers that contained mobile NAPL in previous years have been depleted to residual saturations and no longer pose a threat to the Willamette River.

NAPL mobility testing in 2004 on 15 cores that contained the highest saturations in areas targeted as containing NAPL, showed that saturations ranged from 1-15.8% and that NAPL was residual at 12% and below. Only the sample with 15.8% was described as being oil-wet. Other samples described as having a heavy or moderate sheen, were shown to be a residual concentrations based on the NAPL mobility testing.

This study was designed to increase our understanding the nature and extent of the product observed in MW-20i. None of the borings advanced surrounding MW-20i showed any evidence of NAPL that could migrate to MW-20i. Therefore, the source of NAPL to MW-20i is considered to be limited (i.e. there is not a significant, large pool of NAPL recharging MW-20i).

5.0 RECOMMENDATIONS

Although the source of NAPL to MW-20i is unknown, no mobile product was observed in the four soil borings that were advanced in the vicinity of this well. Moderate sheen and staining were observed on the soil from SC0211 at the depth where free product was previously observed when MW-20i was installed in January of 1990 and thin layers of light to moderate sheen was observed in the borings at the smear zone and various other depths. On-going contributions of DNAPL to MW-20i may be the result of a small localized pool or pools of mobile NAPL in the vicinity of MW-20i, but this product is not believed to be of significant quantity or mobility to threaten the Willamette River. While NAPL is expected to continue to slowly migrate downward in the subsurface due to the soil's intermediate oil-wet condition, based on the large number of soil borings that have been advanced in the FWDA outside the barrier wall, there is no evidence of a large pool of NAPL that would threaten the Willamette River. For NAPL to migrate, NAPL saturations must be greater than residual saturation over a continuous path from the source to a potential discharge area. The data to date suggests that although there are local pockets of mobile NAPL, as evidenced by the continued ability to recover

NAPL from MW-20i, there is not likely a significant continuous pathway that exists through which NAPL will reach the Willamette River.

DEQ and EPA were on-site to observe some of the sonic drilling activities and had a chance to inspect all of the soil cores. Based on the findings from the DNAPL investigation and discussions with the project team, DEQ and EPA determined that NAPL recovery is no longer necessary at McCormick and Baxter. The agencies directed Hart Crowser/GSI to conduct two biweekly (in May 2011) and two monthly (June and July 2011) NAPL gauging efforts following the discontinuation of DNAPL removal in order to collect information regarding the recovery of NAPL in the wells. A final decision on NAPL recovery will be issued following the Technical Team's Annual Meeting in August 2011.

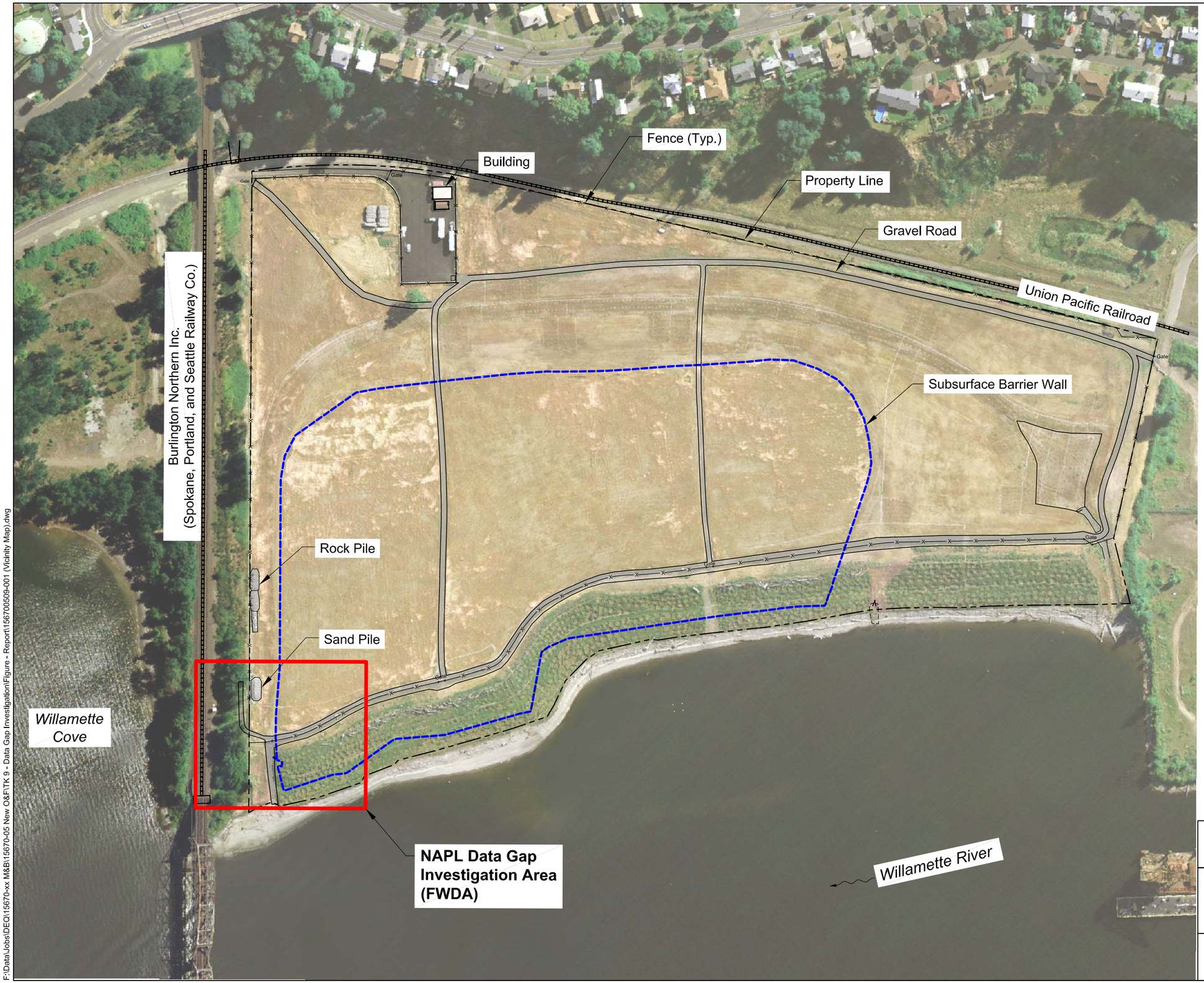
6.0 REFERENCES

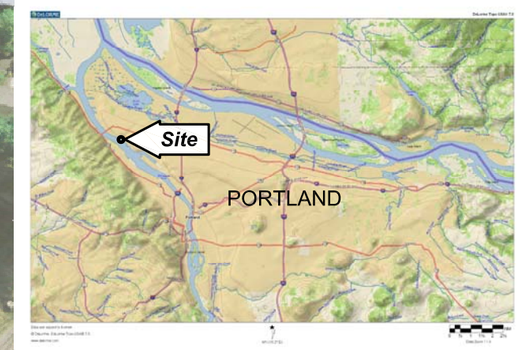
GSI Water Solutions, Inc., 2007. *Post Remedial Action Conceptual Site Model for NAPL Transport, McCormick and Baxter Creosoting Company Site, Portland, Oregon.* March 2007.

Hart Crowser/GSI, 2010. *Sampling and Analysis Plan DNAPL Data Gap Investigation, McCormick and Baxter Creosoting Company Site, Portland, Oregon.* February 2010.

Hart Crowser/GSI, 2011. *2010 Operation and Maintenance Report, McCormick and Baxter Superfund Site, Portland, Oregon.* June 27, 2011.

FIGURES





Subsurface Barrier Wall

NAPL Data Gap Investigation Area (FWDA)

N

0 200 400

Scale in Feet

McCormick and Baxter Superfund Site
Portland, Oregon

Vicinity Map

4/11

HARTCROWSER

GSI Water Solutions, Inc.

Figure
1

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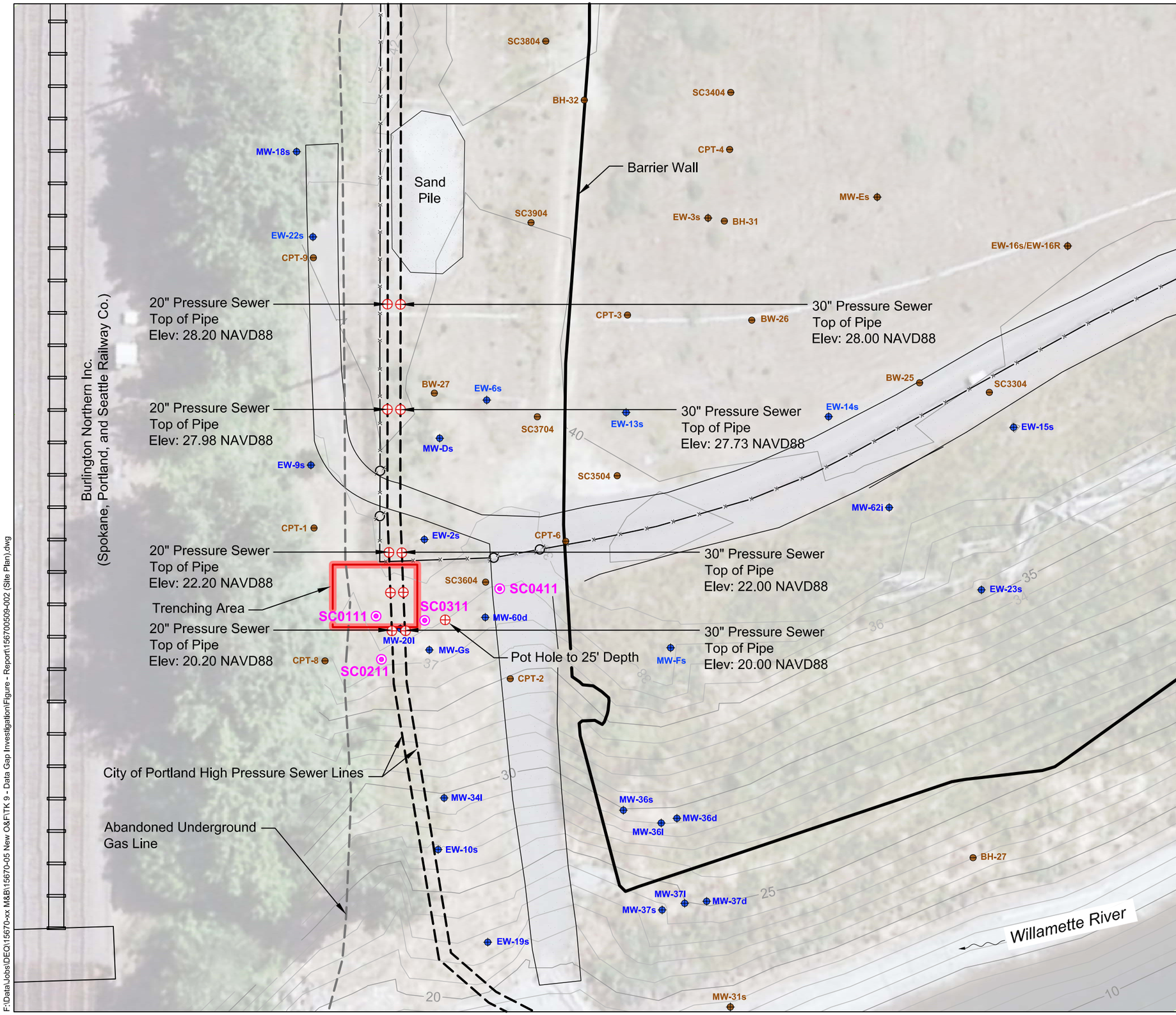


Vacuum Truck Pot Hole

SC0111 New Boring

EW-15s Monitoring Well

EW-14s Abandoned Monitoring Well

SC3304 Soil Boring

-40 Elevation Contour (Ft. NAVD 88)

Site Fence

City of Portland High Pressure Sewer Line

N

0 30 60

Scale in Feet

McCormick and Baxter Superfund Site
Portland, Oregon

DNAPL Data Gap Investigative Exploration Plan

6/11

HARTCROWSER

GSI Water Solutions, Inc.

Figure

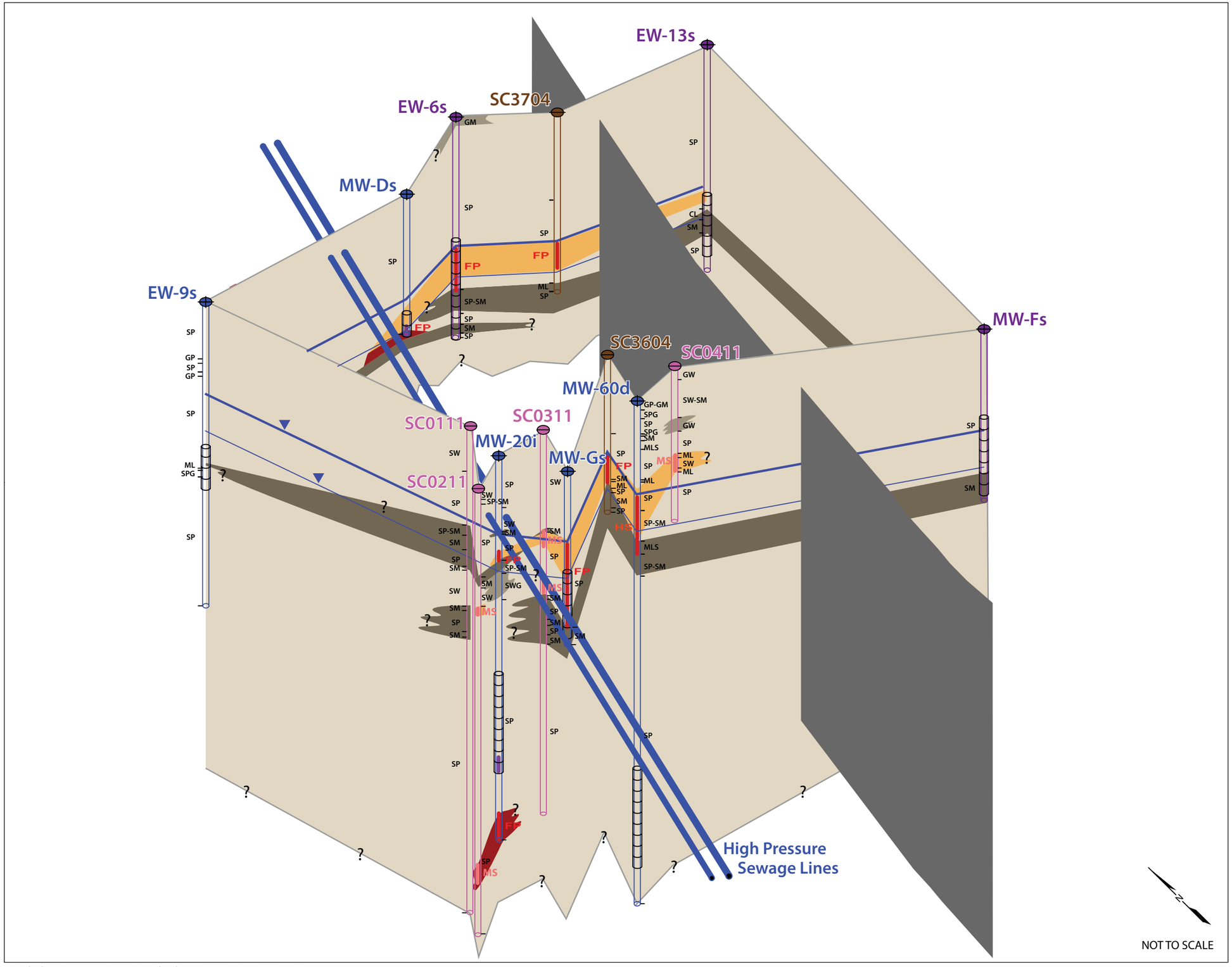
2

F:\Data\Jobs\DEQ\15670-xx M&B\15670-05 New O&F\TK 9 - Data Gap Investigation\Figure - Report\156700509-002 (Site Plan).dwg

FIGURE 3

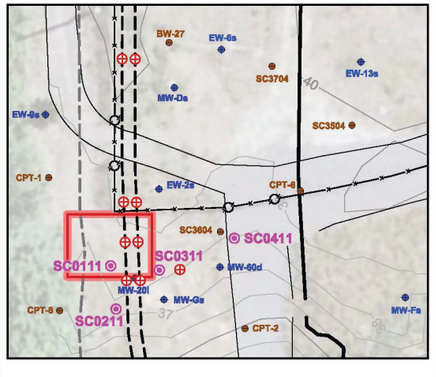
Fence Diagram

McCormick and Baxter



LEGEND

- Smear Zone (Residual Product)
- DNAPL (Residual Product)
- NAPL as Heavy Sheen or Free NAPL on Boring Log
- Moderate Sheen
- LNAPL in Well (2010)
- DNAPL in Well (2010)
- Silt or Silty Sand
- Gravel
- Sand
- Barrier Wall
- Soil Boring
- Monitoring Well
- Abandoned Monitoring Well
- DNAPL Investigative Boring
- Approximate Seasonal High Unconfined Groundwater
- Approximate Seasonal Low Unconfined Groundwater



HARTCROWSER

GSI Water Solutions, Inc.

P:\Portland\205 - OR DEQ\003 - 003 McCormick and Baxter\2010 Data Gaps\CSM\Fence Diagram

APPENDIX A
FIELD AND QA/QC PROCEDURES AND BORING LOGS

APPENDIX A
FIELD AND QA/QC PROCEDURES AND BORING LOGS

This appendix presents the procedures that Hart Crowser/GSI used to complete the fieldwork for the DNAPL investigation activities in March and April 2011 at the McCormick and Baxter Superfund Site in Portland, Oregon (Figure 1). Field quality assurance/quality control (QA/QC) is also discussed.

1.0 FIELD AND SAMPLING PROCEDURES

Field and sampling procedures included the following:

- Sewer Line Locating;
- Sonic explorations;
- Sample management (e.g., containers, storage);
- Decontamination procedures; and
- Handling of investigation-derived waste (IDW).

1.1 Sewer Line Locating

On March 10, 2011, Clearwater Environmental of Wilsonville, Oregon (under subcontract to Hart Crowser) used a CAT 420 D backhoe to trench to 15 feet below ground surface (bgs) to locate the City of Portland (COP) high-pressure sewer lines, but due to loose sands could not locate the lines. Hart Crowser and COP representatives were present to observe and document (e.g., photographs, field notes) the trenching activities and subsurface conditions encountered. No soil or groundwater samples were collected for laboratory analysis.

On March 17, 2011, Clearwater used a CAT 320 CLU excavator with 8-foot shoring to trench to 18 feet bgs, but efforts were abandoned as the contractor was worried unstable shoring (due to loose sands) would damage the high pressure sewer lines. Hart Crowser and COP representatives were present to observe and document the trenching activities and subsurface conditions encountered. No soil or groundwater samples were collected for laboratory analysis.

From April 6 through 11, 2011, 11 pot holes were completed by Bravo Environmental of Portland, Oregon, using a CAT 305 CR mini-excavator and positive displacement Vactor Hydro-Excavator truck to locate and inspect the backfill material surrounding the sewer lines (Figure 2). Hart Crowser and COP

representatives were present to observe and document the trenching activities and subsurface conditions encountered. No soil or groundwater samples were collected for laboratory analysis. Latitude and longitude coordinates for all pot hole locations were obtained using a Trimble GeoXT handheld Global Positioning System (GPS).

1.2 Sonic Explorations

From April 12though 15, 2011, four sonic explorations (SC0111, SC0211, SC0311, and SC0411) were completed to assess subsurface soil and groundwater conditions for DNAPL. Boring SC0111 was completed to 110 feet below ground surface (bgs), SC0211 to 100 feet bgs, SC0311 to 80 feet bgs, and SC0411 to 35 feet bgs. Cascade Drilling, of Portland, Oregon, completed the boring under subcontract to Hart Crowser. Hart Crowser, GSI, DEQ, and EPA representatives were present to observe and document the sonic boring activities and subsurface conditions encountered. The boring was completed in accordance with Oregon Water Resources Department (OWRD) regulations using the procedures below.

Sonic drilling technology consists of an oscillator or head with eccentric weights driven by hydraulic motors to generate high sinusoidal force in a rotating pipe drill. The frequency of vibration of the drill bit or core barrel is varied to allow optimum penetration of subsurface materials. A dual string assembly allows advancement of casing with the inner casing used to collect samples. If free NAPL was encountered above the silt layer (about 25 to 40 ft bgs), then borehole step-down seals were constructed to protect against potential inadvertent spread of shallow contaminants into deeper zones. Step-down seals involved filling the lower portion of the outer temporary casing with cement-bentonite grout, allowing the seal to set, and then advancing smaller-diameter (six inch) casing through the consolidated cement-bentonite grout seal. If no free NAPL was observed in the boring, then step-down seals were not completed.

Underground Utility Location. Hart Crowser arranged to have underground utilities located and marked prior to beginning the field investigation work. On March 4, 2011, Locates Down Under, Inc. (under subcontract to Hart Crowser), located the underground utilities at the site. Due to the depth of the COP sewer lines (greater then 10 feet depth) trenching and pot holing was necessary to locate the lines.

Soil Sampling Procedure. Continuous soil cores were collected and representative samples were obtained over the full depth of the exploration. The sampling procedure involved driving the soil sampler using a combination of hydraulic pressure and mechanical hammer blows. After driving the sampler 5

feet, it was removed from the hole, and the sample core was removed (the core is contained in a clear, plastic sleeve inside the sampler barrel). The sampler was then prepared for driving the next 5-foot-depth interval (or portion thereof).

Each core was visually examined to determine whether there is free NAPL in the sample and noted soil features using the Unified Soil Classification System (USCS) in general accordance with ASTM 2487 and ASTM 2488. In addition to the physical soil description other distinguishing features such as sedimentary structures, vegetation, debris, and evidence of biological activity were documented on the boring log. Select soil samples were transferred from the core into labeled, laboratory-supplied sample jars using a clean stainless steel spoon. Sample jars were fully filled, leaving no headspace. Extra soil generated during drilling activities was drummed for handling and disposal as IDW.

Field Screening. Soil obtained from the soil cores was field screened for creosote related chemicals using a sheen test (a visual test to assess if sheen is produced on water by the soil). A small portion of the soil sample was placed in a wide-mouth, glass jar partially filled with water. The presence of petroleum hydrocarbons was indicated if a sheen was produced on the water surface in the jar.

Groundwater Sampling. As no recoverable DNAPL was observed in the soil cores, no discrete DNAPL/groundwater sampling was performed.

Boring Abandonment. After sampling activities were completed, the explorations were located by obtaining latitude and longitude coordinates using a Trimble GeoXT handheld GPS. Each boring was abandoned in accordance with OWRD regulations by using a tremie pipe to pump them completely full with cement-bentonite grout. The surface was then finished to match the surrounding surface and areas of disturbed vegetation were reseeded with native grass seed.

1.3 Sample Management

Clean sample containers for soil and water samples were provided by Pace Analytical Services of Minneapolis, Minnesota, ready for sample collection, including appropriate preservatives. A sample label was affixed to each sample container and marked with a unique sample number, date of collection, project number, and sampler's initials. These samples were placed in a cooler with ice and transferred to the Hart Crowser refrigerator. Samples were not analyzed as minimal DNAPL was observed.

1.4 Decontamination Procedures

Personnel Decontamination. Personnel decontamination procedures depend on the level of protection specified for a given activity. The site-specific Health and Safety Plan identified the appropriate level of protection for the type of work and conditions involved in this project. Field personnel thoroughly washed their hands at the end of each day and before taking any work breaks.

Equipment Decontamination. Clean, dedicated sampling equipment (e.g., disposable tubing) was used and discarded after use to prevent cross contamination between sampling locations and events. Cleaning of non-disposable items consisted of washing in a detergent (Alconox®) solution, rinsing with deionized water, followed with a methanol rinse. To reduce the chance for cross-contamination between borings, exploration equipment was cleaned with a high-pressure washer before and after each exploration.

1.5 IDW Handling

IDW consisted of extra material from the soil sampler (i.e., soil not placed in a sample jar), decontamination water, and personal protective equipment (PPE). IDW was segregated and stored temporarily in properly labeled Department of Transportation approved 55-gallon drums (soil and water) or hazardous waste totes (PPE) pending disposal.

2.0 FIELD QUALITY ASSURANCE/QUALITY CONTROL

QA/QC was practiced throughout the field activities. As discussed above, all sampling equipment was decontaminated or disposed of between sampling events. All laboratory containers, including field duplicates that were collected, were marked with the project number, a unique sample identification number, the date and time of collection, and the sampler's initials. Each soil and groundwater sample container was packed in a cooled ice chest for field storage and transport. Standard chain of custody protocols were followed at all times.

GSI Water Solutions, Inc.

Boring Number: SC0111

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 13-14, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
0			Ground Surface	
	>90%		Well-graded sand (SW), loose, moist, brown, sand is fine to coarse, occasional gravel near surface	6-inch diameter borehole from 0' to 110' No sheen, no staining
5				No sheen, no staining
			Well-graded sand (SW), loose, moist, red brown, sand is fine to coarse	
10	>90%		Poorly graded sand (SP), loose, moist, brown, sand is predominantly medium grained but ranges from fine to coarse	No sheen, no staining
15				
20				No sheen, no staining
			Poorly graded sand with silt (SP-SM), loose, moist, brown, sand is predominantly medium grained but ranges from fine to coarse	No sheen, no staining
	10%		Silty sand (SM), color grades to gray with depth, sand is predominantly medium grained but ranges from fine to coarse	Rock in core tube, poor recovery from 22.5' to 25' Water at 24'
25	>90%		Poorly graded sand (SP), loose, wet, gray, sand is predominantly medium grained but ranges from fine to coarse	No sheen, no staining
			Silty sand (SM), dense, wet, gray, sand is fine	
30				No sheen, no staining

GSI Water Solutions, Inc.

Boring Number: SC0111

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 13-14, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
			Well-graded sand (SW), loose, wet, gray, sand is fine to coarse	
35			Grades to coarser sand and occasional fine gravel with depth Color grades to dark gray	No sheen, no staining
			Silty sand (SM), dense, wet, dark gray, sand is fine	No sheen, no staining
40			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse	
			Silty sand (SM), dense, wet, dark gray, sand is fine	
			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse	No sheen, no staining
45	>90%			
50				No sheen, no staining
55				No sheen, no staining
60				No sheen, no staining

Boring Number: SC0111

GSI Water Solutions, Inc.

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 13-14, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse	
65				No sheen, no staining
70				No sheen, no staining
75	>90%			No sheen, no staining
80				
85				No sheen, no staining, no odor
90				No sheen, no staining

GSI Water Solutions, Inc.

Boring Number: SC0111

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 13-14, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse	
95				No sheen, no staining
				No sheen, no staining
100	>90%			
				Light sheen, no staining at 101'
105				No sheen, no staining
110				Total depth at 110'
			End of Log	
115				
120				

Boring Number: SC0211

GSI Water Solutions, Inc.

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 12-13, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
0			Ground Surface	
	>90%		Well-graded sand (SW), loose, moist, dark brown, sand is fine to coarse, trace silt	8-inch diameter borehole from 0' to 31'
			Poorly graded sand with silt (SP-SM), loose, moist, dark brown, sand is predominantly medium grained but ranges from fine to coarse	No sheen, no staining, PID < 1
			Poorly graded sand (SP), loose, moist, dark brown, sand is predominantly medium grained but ranges from fine to coarse	
5				
				No sheen, no staining, PID < 1
10				
				Poor recovery from 11' to 16'
	60%			
15				
	>90%			
20				
				No sheen, no staining, PID < 1
	80%		Silty sand (SM), dense, moist, dark brown, sand is predominantly medium grained but ranges from fine to coarse, occasional fine gravel	
25			Well-graded sand (SW), loose, moist, dark gray, sand is fine to coarse	Color change below silty sand No sheen, no staining, PID < 1
				Water at 27'
	>90%		Well-graded sand (SW), loose, wet, dark gray, sand is fine to coarse	No sheen, slight odor, PID < 1
30				

GSI Water Solutions, Inc.

Boring Number: SC0211

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 12-13, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse	6-inch diameter borehole from 31' to 105' No sheen, slight odor at 31'
35				Moderate sheen, heavy staining at 35' to 36' PID = 13.7
				No sheen, no staining, PID = 1.8
40				
				No sheen, no staining, PID < 1
45	>90%			
				No sheen, no staining, PID < 1
50				
				Slight staining at 53' to 54.5'
55				
				No sheen, no staining, PID < 1
60				

Boring Number: SC0211

GSI Water Solutions, Inc.

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 12-13, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse	
65				No sheen, no staining, PID < 1
70				
	>90%			
75				
			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to medium	Grades to fine to medium sand at 76'
80				No sheen, no staining
85				Slight sheen and staining, poor recovery from 85' to 90'
	20%			
90				

GSI Water Solutions, Inc.

Boring Number: SC0211

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 12-13, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
	>90%		Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse	Moderate sheen and heavy staining at 91' Moderate sheen and dark staining at 94' to 98' PID = 3.5
95				
100			Poorly graded sand (SP), dense, wet, dark gray, sand is predominantly medium grained but ranges from fine to medium, trace silt	Light sheen, light staining at 98'
			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse	Light sheen, slight staining at 101'
105			End of Log	Total depth at 105'
110				
115				
120				

GSI Water Solutions, Inc.

Boring Number: SC0311

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 14-15, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
			Ground Surface	
0			Well-graded sand with gravel (SW), organics present	6-inch diameter borehole from 0' to 80'
				No sheen, no staining
			Well-graded sand (SW), dense, wet, brown, sand is fine to coarse, occasional fine gravel, trace silt	
5			Well-graded sand (SW), loose, moist, brown, sand is fine to coarse, occasional fine gravel	No sheen, no staining
10				
15	>90%			No sheen, no staining
				Moderate sheen, heavy staining at 19.5' to 20'
20			Silty sand (SM), dense, moist, gray, sand is fine	No sheen, no staining
			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse, wood debris present	Slight sheen at 21'
				Moderate sheen, heavy staining in wood debris at 22'
				Moderate sheen, heavy staining in wood debris at 23' PID = 29.8
				Moderate sheen, moderate staining in wood debris at 24' PID = 23.0
25			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse	Light sheen, moderate staining at 25'
				Water at 27' Light sheen, light staining at 27.5'
30				

GSI Water Solutions, Inc.

Boring Number: SC0311

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 14-15, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
				Moderate sheen, heavy staining at 30' to 34' PID = 37.9
			Silty sand (SM), dense, wet, dark gray, sand is fine	
35			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to medium	Progressively less sheen and staining with depth
			Silty sand (SM), dense, wet, dark gray, sand is fine	No sheen, no staining
40			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to medium	Slight sheen, no staining
			Silty sand (SM), dense, wet, dark gray, sand is fine	No sheen, no staining
			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse	No sheen, no staining
45	>90%			
50				No sheen, no staining
55				
				No sheen, no staining
60				

GSI Water Solutions, Inc.

Boring Number: SC0311

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 14-15, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse	No sheen, no staining
65				No sheen, no staining
70	>90%			No sheen, no staining
75			Wood debris present at 76'	No sheen, no staining No sheen, no staining
80			End of Log	Total depth at 80'
85				
90				

GSI Water Solutions, Inc.

Boring Number: SC0411

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 15, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
			Ground Surface	
0			Well-graded gravel (GW), loose, wet, dark gray, gravel is angular and fine to coarse grained (part of a road)	6-inch diameter borehole from 0' to 35'
			Well-graded sand with silt (SW-SM), loose, wet, brown, sand is fine to coarse	
5			Well-graded sand with silt (SW-SM), loose, wet, brown, sand is fine to coarse, occasional gravel	No sheen, no staining
10			Well-graded gravel (GW), loose, wet, gray, gravel is fine to coarse	No sheen, no staining
15	>90%		Poorly graded sand (SP), loose, wet, brown, sand is predominantly medium grained but ranges from fine to coarse	No sheen, no staining
				Moderate sheen and thin layer of staining at 18.5'
			Silt (ML), dense, moist, dark gray	
20			Well-graded sand (SW), loose, wet, brown, sand is fine to coarse	No sheen, no staining
			Color grades to gray Wood waste at 22'	
			Silt (ML), stiff, moist, gray	Moderate sheen, PID = 11.8 at 22.5'
			Poorly graded sand (SP), loose, wet, dark gray, sand is predominantly medium grained but ranges from fine to coarse	Light sheen, light staining at 23'
25				
				Light to moderate sheen and staining at 28'
30				

GSI Water Solutions, Inc.

Boring Number: SC0411

Client: Oregon Dept of Environmental Quality
Project: McCormick & Baxter NAPL Investigation
Location: Former Waste Disposal Area (FWDA)
Project Number: 205.010

Driller: Cascade Drilling
Drilling Method: Sonic Core 17-C
Sampling Method: Continuous Core
Logged by: P. Robinette
Start/Finish Date: April 15, 2011

Depth (ft)	Recovery	Graphic Log	Soil Description	Comments
	>90%			Light sheen, light staining at 31'
				No sheen, no staining at 33.5'
35			End of Log	Total depth at 35'
40				
45				
50				
55				
60				

APPENDIX B
PHOTOGRAPH LOG

Photograph 1 – Sewer line excavation near EW-2s. Photograph facing north.

Photograph 2 – Abandoned gas utility near Burlington North right-of-way. Photograph is facing west.

Photograph 3 – Sewer line excavation near MW-20i. Photograph facing southwest.

Photograph 4 – Shoring used to stabilize loose sands. Photograph is facing north.

Photograph 5 – Pot holing 100 feet upland from MW-20i. Photograph facing southwest.

Photograph 6 – Sewer line at 12 feet depth.

Photograph 7 – Sewer line pot holes following lines towards MW-20i. Photograph facing west.

Photograph 8 – Pot holing to 25 feet depth.

Photograph 9 – Pot holing for sewer lines near MW-20i. Photograph facing northwest.

Photograph 10 – Sonic soil boring SC0211. Photograph facing west.

Photograph 11 – Sonic soil boring SC0111. Photograph facing north.

Photograph 12 – Sonic soil boring SC0311. Photograph facing west.

Photograph 13 – Sonic soil boring SC0411. Photograph facing north.

Photograph 14 – Representative lithology: color change in well-graded sand (SW) collected from SC0111 (5-7.5 feet bgs)

Photograph 15 – Representative Lithology: poorly graded sand (SP) collected from SC0111 [105-100 feet bgs (front) and 110-105 feet bgs(back)].

Photograph 16 – Well-graded gravel observed 11 to 14.5 feet bgs in SC0411.

Photograph 17 – Silt layer observed 19-19.5 feet bgs in SC0411. Note the sheen and thin layer of staining on the upper (right) side of the silt layer.

Photograph 18 – Sheen and staining observed on top (right) of silty sand layer at 34 feet bgs in SC0311.

Photograph 19 – Sheen and staining observed in poorly graded sand (SP) at a depth of approximately 95 feet bgs in SC0211.

APPENDIX B
SITE OBSERVATION AND ACTIVITY SUMMARY

OPERATION AND MAINTENANCE REPORT
JANUARY 2011 THROUGH DECEMBER 2011

Hart Crowser/GSI
15670-06/Task 5 May 23, 2012

APPENDIX B
CONTENTS

FIGURE

ATTACHMENTS

APPENDIX B
CONTENTS Cont.

ACRONYMS

ACB	Articulated Concrete Block
BNRR	Burlington Northern Railroad
Clearwater	Clearwater Environmental Services, Inc.
COP	City of Portland
DEQ	Oregon Department of Environmental Quality
EPA	United States Environmental Protection Agency
NAPL	Nonaqueous Phase Liquid
NAVD	Northern American Vertical Datum
NOAA	National Oceanographic and Atmospheric Administration
O&M	Operation and Maintenance
Site	McCormick & Baxter Superfund Site
TFA	Tank Farm Area
TRM	Turf Reinforced Matting

APPENDIX B
SITE OBSERVATION AND ACTIVITY SUMMARY
OPERATION AND MAINTENANCE REPORT
JANUARY 2011 THROUGH DECEMBER 2011
MCCORMICK AND BAXTER SUPERFUND SITE

1.0 INTRODUCTION

This Appendix B to the *January 2011 through December 2011 Operation and Maintenance (O&M) Report* (O&M Report) presents a summary of sediment and soil cap observation and maintenance activities at the McCormick & Baxter Superfund Site (Site) for the reporting period from January 1, 2011, through December 31, 2011. Attachments A through F provide detailed information about the activities.

These activities were funded by the Oregon Department of Environmental Quality (DEQ) through a Cooperative Agreement with United States Environmental Protection Agency (EPA). The location of the Site, the Site layout, and surface elevations are shown on Figures 1 through 3 in the main section of the O&M Report.

2.0 SITE OBSERVATIONS

Site observations and maintenance activities were conducted according to the *Draft Final Operation and Maintenance Plan* (DEQ, 2007). As directed by DEQ, the frequency of inspections was reduced from monthly to quarterly in April 2010. Soil and sediment cap inspections were conducted by DEQ, Hart Crowser, and GSI in March, June, August, and December 2011. Observations of interest from the routine inspections and site meetings are summarized on Figure B-1.

These routine inspections are documented in observation forms developed and recorded for the Site. Attachments pertinent to site activity and observations are:

- Attachment A: Site Activity Log;
- Attachment B: Sediment Cap Observations;
- Attachment C: Buoy Design Documentation;
- Attachment D: Soil Cap Observations;

- Attachment E: Site Meeting Summaries; and
- Attachment F: Photograph Documentation.

Clearwater Environmental Services (Clearwater), under subcontract to Hart Crowser, provided general O&M services through June 2011, when nonaqueous phase liquid (NAPL) removal activities were determined to be no longer necessary at the Site (Appendix A). O&M activities have since been completed by Hart Crowser (i.e., July through December 2011). As Site activities have been significantly reduced, non-essential equipment will be decommissioned in 2012. Equipment will be surplused, e-cycled, recycled, or disposed, as appropriate.

2.1 Sediment Cap Observations

The sediment cap was inspected four times in 2011. The inspections were conducted in conjunction with three quarterly Site meetings and the annual technical team meeting. Routine sediment cap inspection documentation is included in Attachment B. Sections 2.1.1 through 2.1.3 below describe sediment cap observations regarding habitat enhancement features and wildlife, sediment cap features, and vandalism and/or trespassing. A slight sheen (most likely iron-related) was observed in sand in several locations along the shoreline in August 2011, consistent with observations from previous years. A detailed discussion of the Site sheen's nature, origin, and extent are included in the *January 2009 through December 2009 Operation and Maintenance (O&M) Report Appendix F* (Hart Crowser/GSI, 2010). In general, the condition of the sediment cap remains in good condition.

2.1.1 Habitat Enhancement Features and Wildlife

Habitat enhancement features, such as boulder clusters and sand cover as a biotic layer, are design elements of the sediment cap. Large woody debris also provide habitat enhancement and are present along the shoreline and in the riparian area above the shoreline. Generally, the distribution of sand is similar to previous years: sand is in place over a large portion of the Site, but absent over articulated concrete block (ACB) armoring where the bank slope is steeper and in Willamette Cove. Gravel is recommended to replace previous areas of sand cover on the ACB to create a more stable substrate for wildlife and a consistent and safer walking surface for public use.

The large woody debris present along the length of the shoreline is replaced at higher shoreline elevations during high river events. The amount of woody debris present at the Site appears to be consistent every year. The highest river

elevations recorded since the sediment cap was installed occurred in June 2011, reaching 22 foot North American Vertical Datum [NAVD] 88 or 1 foot below the 23 foot flood stage (Photograph 1). Moderate erosion of soil mulch and vegetation cover on the green turf reinforced matting (TRM) occurred along the lower riparian area where the TRM is attached to the ACB. Vegetative cover does not appear to be eroded at elevations above the ACB (Photograph 4).

Three areas of the shoreline appear to accumulate more woody debris than others:

- The south end of the shoreline near the City of Portland (COP) outfall (Photograph 3);
- Along the shoreline near the former tank farm area (TFA); and
- The north end of the Site near the Burlington North Railroad (BNRR) bridge.

Boulder clusters placed during the sediment cap construction remain in place. Numerous wildlife species continue to be observed at the Site; most frequent are various birds, including Canada geese, gulls, pigeons, blue herons, and ospreys (Photograph 6). Juvenile fish, clams, and crayfish were observed most often in the Willamette River at lower river levels.

2.1.2 Buoy Installation

Following cap construction in 2004, five temporary buoys were placed to mark the outer boundary of the sediment cap to warn of potential underwater hazards: two in Willamette Cove, and three south of the BNRR bridge. Since 2008, four of these buoys were removed, most likely the result of high river levels and debris contact with anchor lines. On August 12, 2011, five permanent buoys were installed by Northwest Underwater Construction of Vancouver, Washington, under subcontract to Hart Crowser, marking the sediment cap (Photographs 7, 8, and 9). The designated locations for the newly installed permanent buoys are shown on Figure B-1.

The permanent buoys were designed for river hydraulic forces equal to a 500 year flood (same as the sediment cap), and include an anchor that has minimal movement and minimal maintenance connected to a chain designed to withstand river hydraulic and reasonable (expected) debris forces. Each buoy includes United States Coast Guard orange reflective diamond-shaped markings and “Danger Rocks” warning boat operators of the shallow rocks from the sediment cap. Buoy design specifications and calculations are included in Attachment C.

2.1.3 Vandalism and Trespassing

The shoreline along the Site and in Willamette Cove is accessible, and is often used by the public for various forms of recreation. Throughout 2011, various amounts of shoreline trash and graffiti were observed. In the Spring of 2011, a transient structure made from drift wood was observed along the shoreline and dismantled by Clearwater (Photograph 10). No full-time occupants were observed in the drift wood structure. Additionally, two dilapidated boats (obviously used as dwellings) were seen beached in Willamette Cove (Photograph 11). The transient boats were beached on the Metro owned portion of Willamette Cove for approximately one week. The transient boats were subsequently removed from the beach; however, transient boats continue to be periodically observed anchored in Willamette Cove. Metro has actively been monitoring the transient use of the cove. The boats appear far enough north within Willamette Cove that they were not anchored on the sediment cap (Photograph 12).

2.2 Soil Cap Observations

The soil cap was inspected four times in 2011. The inspections were conducted in conjunction with three quarterly Site meetings and the annual technical team meeting. Soil cap observation documentation is included in Attachment D.

2.2.1 Wildlife

The upland soil cap provides habitat for rabbits, ground squirrels, Canada geese, several species of birds, and coyotes (likely). Despite additional gravel placement in 2008 to fill the gap beneath fencing surrounding the upland portion of the Site, evidence of periodic burrowing continues to be observed under the southwest fence along the perimeter road (Figure B-1). These burrows are routinely filled back in and are not of major concern.

Evidence of ground squirrel activity was observed at several locations south of the site trailers and various areas throughout the upland soil cap. Ground squirrels are common to the general vicinity of the area, and their burrows typically extend to approximately 1 foot below ground surface. Ground squirrels prefer hillsides and low earth banks, sometimes using structures such as trees and boulders for cover (Larson, 2007). It appears the ground squirrels are using the surplus ACB stockpiled at the Site, paved roadway, and concrete well monuments as habitat. There are no indications that any of these borrows exist below the depth of the soil cap, and therefore the soil cap continues to physically isolate site contaminants from human and ecological receptors. Continued

monitoring of the burrows is recommended; no action to remove burrowing animals or to fill in the burrows is planned or is necessary at this time.

2.2.2 Vandalism and Trespassing

The gate at the top of North Edgewater Road marks the entrance to the Site and Willamette Cove property. This gate is locked with a series of locks and chain to provide access for two railroads, DEQ, and other agencies that require access to the area. Railroad tracks along the Site and neighboring properties are often used by the transients and the general public to access the area. Access to the area generally does not affect security at the Site because of the surrounding fence, lighting, and alarm system. However, during the quarterly site inspection on December 13, 2011, a section of the eastern perimeter fence had apparently been cut open allowing trespassers to enter the Site (Photographs 13 and 14) and damage one sign (Photograph 15). The fence was repaired by West-Meyer Fence, under subcontract to Hart Crowser, on December 14, 2011. No other damage was observed within the perimeter fence. The fenced area around the office trailers remains secure.

2.3 Soil Cap Subsidence

In June 2008, the inner casing of monitoring well MW-23d was observed to be protruding approximately 4 inches above the outer well casing/monument. A subsequent upland site survey confirmed that the ground surface had subsided in the local vicinity of MW-23d. A *Subsidence in Upland Cap Memorandum* (Hart Crowser/GSI, 2008) and an *Additional Subsidence Monitoring Memorandum* (Hart Crowser/GSI, 2009) were prepared for the DEQ by Hart Crowser/GSI to present the results of the survey and additional investigation to determine the cause of the subsidence. A review of previous subsurface investigations indicated that significant subsurface wood debris was present in this area, leading to the conclusion that degradation of woody debris was occurring and further localized settling is likely to occur over time. Another potential contributing factor to the settling is a declining groundwater level inside the barrier wall. This decline was greater during the first few years after the impermeable cap installation, but the groundwater elevation has stabilized during the past 4 years and now appears to be in equilibrium with the Willamette River (see Appendix A).

Since 2010, subsidence in the MW-23d area has been insignificant. The measured difference between the inner and outer casing of this well was 0.03 inches in calendar year 2011. Total movement between the inner and outer casing since December 2008 (first periodic measurement conducted) is 1.48 inches. Placing an air tight seal on wellhead EW-1s, located within 10 feet of MW-23d, has apparently decreased the rate of settling in this area. Significant future settling

could affect the performance of the stormwater conveyance system and other upland remedy features. The stormwater conveyance system was visually inspected four times during 2011 and continues to perform as designed (Photograph 16).

3.0 MAINTENANCE ACTIVITIES

Maintenance activities at the Site were performed by Clearwater through June 2011. Hart Crowser performed maintenance activities through December 2011. Activities ranged from weekly maintenance of pumps and regulators to non-routine tasks such as fence repairs. In addition to activities performed by Clearwater, other maintenance activities were performed by Instrumentation Northwest, Veolia Environmental Services, Native Ecosystems Northwest, and West-Meyer Fence. The following section discusses routine maintenance tasks and non-routine tasks performed in 2011. Site support services, such as phone, alarm, solid waste, and wastewater were provided by Century Link, Phillips, Trashco Services, and Schulz-Clearwater Sanitation, respectively.

3.1 Routine Maintenance

Clearwater performed routine maintenance on the pumps, compressor, regulators, lines, oil interface meter (used to perform NAPL gauging and extraction), and the Site vehicle (Kubota) through June 2011. O&M activities were also reduced in June 2011 after DEQ and EPA determined that NAPL recovery was no longer necessary at the Site (Appendix A). Thereafter, O&M activities were assumed by Hart Crowser and included transducer data logger repair by Instrumentation Northwest, of Kirkland, Washington.

Site vegetation management was also conducted by Hart Crowser in 2011. Irrigation of site vegetation was not needed, as expected for 2011, and the general planting goals (NOAA, 2004) have been met. Noxious weed control remains the primary ongoing vegetation management activity at the site. Native Ecosystems Northwest of Portland, Oregon, under subcontract to Hart Crowser, completed noxious weed control activities in Spring and Fall 2011. The scope of work included completing application (spot spraying) of glyphosate herbicide and manual hand pulling to mitigate thistle, knapweed, Scotch broom, sweet clover, black mustard, and other noxious weeds within the upland and riparian areas of the Site.

Investigation-derived waste stored at the facility in 2011 included soil, water, and NAPL from the DNAPL Data Gap Investigation (Appendix A); water and NAPL from NAPL extraction activities (Appendix A); and debris from general O&M

activities. Hazardous waste disposal of five 55-gallon drums of soil, seventeen 55-gallon drums of purge water/NAPL, and five 1-cubic yard totes of debris was completed by Veolia Environmental Services of Kent, Washington, under subcontract to Hart Crowser, on September 30, 2011. One 55-gallon drum of IDW soil could not be transported for disposal due to prior damage that occurred while moving the drum from the shoreline to the waste storage area. Soil from this drum will be loaded into a new drum and disposed of in 2012.

3.2 Non-Routine Maintenance Activities

West-Meyer Fence, of Portland, Oregon, under subcontract to Hart Crowser, repaired the perimeter fence along the northwest corner of the site following DNAPL Data Gap Investigation activities in April 2011 (Photograph 17) and along the eastern perimeter fence following vandalism observed in December 2011.

4.0 SUMMARY

Overall, the 2011 sediment cap and the upland soil cap inspections revealed no significant change in remedy performance or areas of concern at the Site. Future O&M activities will be reduced and will consist of primarily quarterly inspections and non-routine maintenance for the next several years. A long term O&M Plan with descriptions of O&M activities and schedule for the next 5 years is expected to be completed by fall 2012. A plan to decommission non-essential equipment at the Site will also be completed in 2012.

While the ACB voids are exposed along steeper portions of the shoreline, sand continues to cover the shoreline at lower, less steep elevations, and there are significant amounts of large woody debris that have accumulated to help create wildlife habitat. Wildlife commonly seen at the Site includes Canada geese, blue herons, ospreys, crawfish, squirrels, and rabbits; evidence of coyotes has also been observed. The general public also frequents the shoreline for recreation, most commonly walking dogs. Infrequent and minor instances of vandalism and littering have been noted. Additional habitat gravel is recommended to fill in the ACB voids along the steeper portions of the shoreline to create a more stable substrate for wildlife and for a consistent and safer walking surface for public use.

The degree of upland soil cap subsidence in the vicinity of MW-23d is relatively stable and appears be related to the aerobic subsurface conditions, which are now no longer present. Minimal subsidence was observed in 2011 and groundwater elevations within the barrier wall are stable. To maintain and monitor performance of the stormwater conveyance system, inspections, transducer monitoring in MW-15s and EW-1s, and elevation differencing

measurement at well MW-23d should be carried forward into a long term O&M Plan for the Site.

5.0 REFERENCES

DEQ, 2007. *Draft Final Operation and Maintenance Plan, McCormick and Baxter Creosoting Company Superfund Site, Portland, Oregon*. March 2007.

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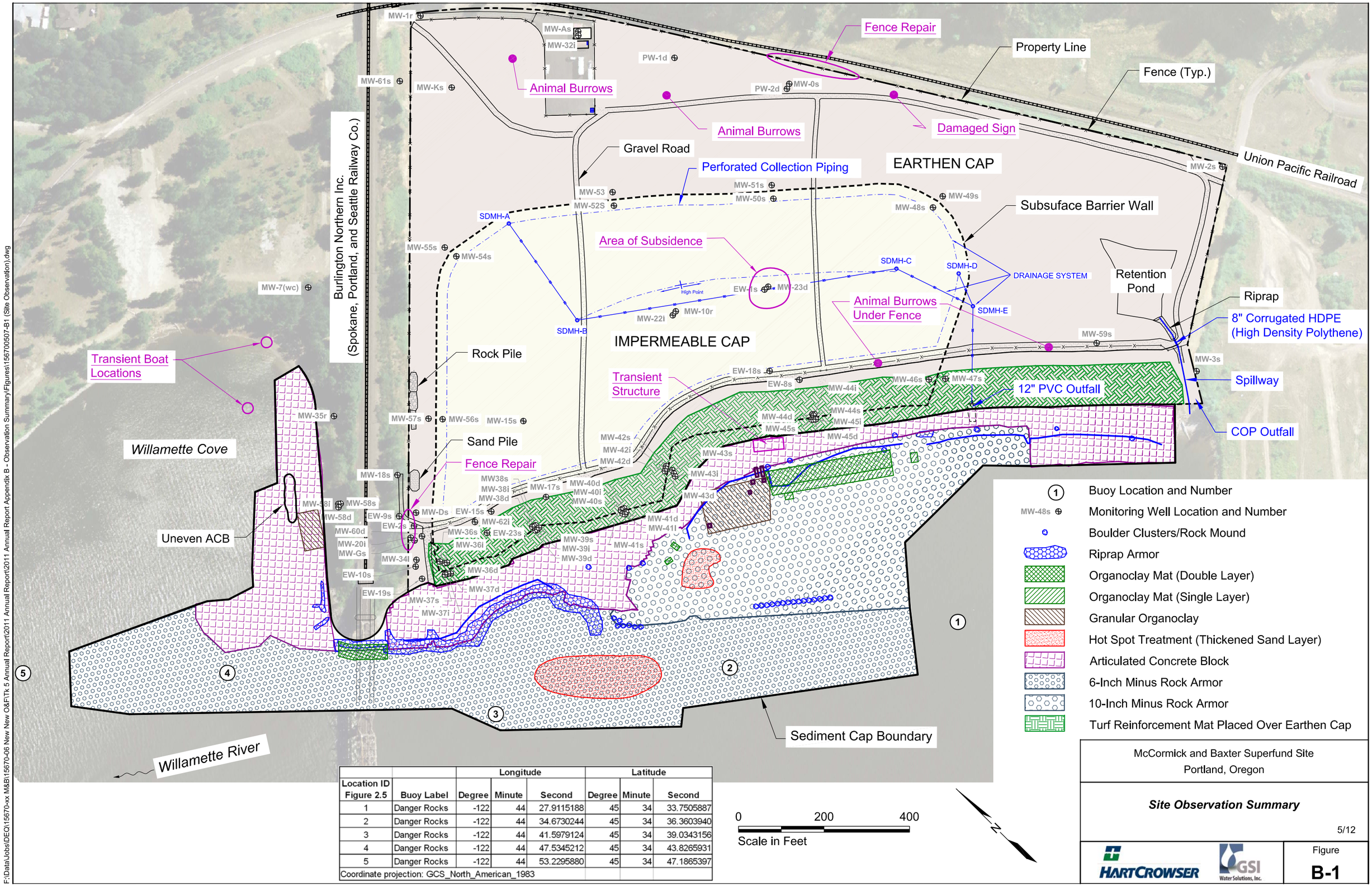


Location ID Figure 2.5	Buoy Label	Longitude Degree	Longitude Minute	Longitude Second	Latitude Degree	Latitude Minute	Latitude Second
1	Danger Rocks	-122	44	27.9115188	45	34	33.7505887
2	Danger Rocks	-122	44	34.6730244	45	34	36.3603940
3	Danger Rocks	-122	44	41.5979124	45	34	39.0343156
4	Danger Rocks	-122	44	47.5345212	45	34	43.8265931
5	Danger Rocks	-122	44	53.2295880	45	34	47.1865397
Coordinate projection: GCS_North_American_1983							

McCormick and Baxter Superfund Site
Portland, Oregon

Site Observation Summary

5/12

HARTCROWSER

GSI Water Solutions, Inc.

Figure
B-1

F:\Data\Jobs\DEQ\15670-xx M&B\15670-06 New New O&F\Tk 5 Annual Report\2011 Annual Report\2011 Annual Report Appendix B - Observation Summary\Figures\156700507-B1 (Site Observation).dwg

ATTACHMENT A
SITE ACTIVITY LOG

Included only on the O&M Report CD

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
01/3/10	1055	a.m.	11:36	a.m	Jason Miles	Pick up to Hart Crowser	Pick up list, count Drums, and pump
1/5/11	0730	Am	1530	pm	N. Linn	Napl Gauge / Ext	CESI
1/06/11	0800	Am	1600	pm	N. Linn	CESI	O&M
1/12/11	0730	Am	1530	pm	N. Linn	CESI	NAPL Gauge/Ext
1/14/11	0730	am	1530	pm	N. Linn	CESI	O&M
1/20	0730	Am	1530	pm	N. Linn	CESI	NAPL Gauge/Ext
1/21	1425	PM	1550	PM	J. Miles	HC	DL maintenance
1/22	0800	Am	1600	pm	N. Linn	CESI	O&M
1/24	0900	Am	1300	pm	N. Linn	CESI	ALARM REPAIR
1/27	0730	Am	1600	pm	N. Linn	CESI	NAPL Gauge/ ALARM
1/27	100	PM	1530	P	BRENT NORDSTROM	PHILLIPS	ALARM REPAIR
1/28	0800	Am	1600	P	NEWT LINN	CESI	O&M
2/02	0800	Am	1600	P	NEWT. L.	CESI	NAPL Gauge/Ext
2/03	0830	Am	1530	P	N. Linn	CESI	O&M
2/12	0730	Am	1530	P	N. Linn	CESI	NAPL Gauge/Ext
2/13	0800	Am	1600	P	N. Linn	CESI	O&M
2/15	1305	PM	1316	PM	J. Miles	HC	Pick up Grund Fos pump for repair

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
2-17	0730	AM	1530	pm	N. LINN	CESI	NAPL Gauge/EXT
2-19	0800	A	1600	P	N. LINN	CESI	O&M
2/23	0730	A	1530	P	N. LINN	CESI	NAPL Gauge/EXT
2/25	0730	A	1530	P	N. LINN	CESI	O&M
3/2	0730	A	1530	P	N. LINN	CESI	NAPL Gauge/EXT
3/3	0730	A	1530	P	N. LINN	CESI	O&M
3/3	0915	A	1030	Am	J. Miles	H.C	Utility locate
3-4	10:00	Am	10:30	Am pm	R. Littlejohn	L.D.U.	Utility locates
3/9	0800	A	1700	P	N LINN	CESI	Site walk / Equipment / Supplies
3/10	0700	A	1500	P	N. LINN	CESI	Excavate Sewer Line
3/10	0730	A	[redacted]	P	J. Miles	HC	Excavation Sewer lines
3/10	0800	A	1500		J. Quett	CESI	Excavate Sewer lines
3/10	0930	A	11:00	A	B Sherwood	BES	" "
3/10	0930	A	1100	A	H. Nguyen	BES	" " "
3/10	0900	A	[illegible]		T. Skatzki	HC	" " "
3/10	1100	A	Noon		H Blitschke	GSI	
3/10	1100	A	Noon		S Manzano	DEQ	

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
3/11	0730	A	1520	A	N. Linn	CESI	NAPL Gauge/EXT
3/12	0800	A	1600	P	N. Linn	CESI	O&M
3/15	0730	A	1530	P	N. Linn	CESI	Sewer Line Excavation
3/16	0630	A	1500	P	N. Linn	CESI	" "
3/16	0730	A	1500	P	J Quiett	CESI	Sewer Line Exc.
3/16	0130	P	215	P	David Selix	Superior Fence	fence work
3/17	0700	A	1520	P	N Linn	CESI	Sewer Line Exc.
3/17	0730	A	1530	P	J. Quiett	CESI	Sewer Line Exc
3/17	0800	A	1500	P	T. Skrotzki	HC	" " "
3/17	0900	A	230	P	B. Sherwood	BES	" " "
3/17	10:30	A	12:30		H Blaschke	GSI	" " "
3/18	0730	A	1570	P	N. Linn	CESI	" "
3/18	0730	A	0830	P	J. Quiett	CESI	" "
3/18	0815	A	~~0835~~ 1035		Ken Nolan	Superior Fence	
3/19	0730	A	1530	P	N. Linn	CESI	NAPL Gauge/EXT
3/20	0800	A	1600	P	N. Linn	CESI	O&M
3/21	0700	A	0930	A	J Quiett	CESI	Sewer Line

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
3/23	0730	A	1530	P	N. Linn	CCSI	NAPL Gauge/Ext
3/24	0900	A	1700	P	N. Linn	CCSI	O&M
3/29	0730	A	1530	P	N. Linn	CCSI	NAPL Gauge/Ext
3/30	0730	A	1530	P	N. Linn	CCSI	O&M
4/4	0730	A	1530	P	N. Linn	CCSI	NAPL Gauge/Ext
4/5	0730	A	1530	P	N. Linn	CCSI	O&M
4-5	12:55	P	1430	P	Chuck Howd	BRAVO	Service
4/5	12:55	P	1430	P	Mike Hanson	BRAVO	Service
4/6	0700	A	1500	P	N. Linn	CCSI	Sewer Line Excavation
4/6	0800	A	1715		C. Martin	HC	
4/6	7:50	A			Marty Yeager	BRAVO	Pot Hole
4-6	7:50				Kevin Middle	BRAVO	Pot Hole
4-6	7:50	A			LeRoy Wolfe	Bravo	Pot Hole
4-6	7:50	AM			Kc Schaff	Bravo Environmental	Pot Hole
4-6	8:10	A			Chuck Howd	BRAVO	Service
4-6	8:15	A	500	PM	B. Sherwood	BES	Pot Locating
4/6	1:50	PM	2:15	PM	Heidi Blischke	GSI	Air Knifing

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
4/6	1:50	Pm	2:15	Pm	Paul Robarette	GSI	Air Knifing
4/6	1100	pm	500	pm	Tim Skvatzki	Hart Crowser	Air Knifing
4/7	0700	A	1600	P	N Linn	CESI	" "
4/7	0800		1630		C Martin	HC	" "
4-7	8:00	Am	1600		Kevin Middal	BRAVO	"Pot hole"
4-7	8:00	am			Michael Shoalln	Bravo	"Pot hole"
4-7	8	AM			MARTY yeager	BRAVO	Pot Hole
4-7	8:15	AM	3:40	P	B Sherwood	BES	Pot hole
4-7	130	pm	1530	,	Tim Skvatzki	Hart Crowser	Pot hole
4-8	7:45	AM	600	Pm	Marty Yeager	BRAVO	Pot Hole
4-8	745	am	600	PM	Michael Shoalln	Bravo	Pot Hole.
4-8	7:47	am			Andrew Reyes	Bravo Environmental	Pot holing
4-8	750	am	600	Pm	Tim Skvatzki	Hart Crowser	Pot Holing
4-8	0750	A	1800	P	N. Linn	CESI	" "
4-8	0430	Pm	5:00	P	Chuck Harris	BRAVO	" "
4/11	07:8	A	1541	P	J. Miles	Hart Crowser	Pot Holing
4/11	0730	A	15:30	AM	D Quiett	CESI	Pot Holing

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
4-11	745	am	1200		Michael Shoulder	Bravo	Pothole
4-11	7:45	AM	1200		Kevin Middel	BRAVO	Pot hole
4-11	7:45	AM	1200		MARTY Yegger	BRAVO	Pot Hole
4-11	8:10	AM	10:15	AM	Chuck Hand	BRAVO	" "
4-12	730	AM	3:45	PM	JEFF JONES	CDLP	Driller
4-12	7:30	am	345	PM	Josh Neal	CDLP	Helper
4-12	7:30	AM	345	PM	Kaleb Charters	CDLP	Helper
4-12	740	AM	345	PM	PAUL ROBINETTE	GSI	GEO
4-12	730	AM	345	PM	Jason Miles	HC	Field Coordinator
4-12	1230	PM	130	PM	Tim Skrotski	HC	drilling
4/12	2:50	PM	3:30	PM	Heidi Blaschke	GSI	"
4/13	7:24	AM	1635	PM	J. Miles	HC	Field Coordinator
4/13	7:24	AM	1635		P. Robinette	GSI	Geo
4/13	7-24	AM	1655		K. Charters	CDLP	Drilling holes in Ground
4/13	7:25	am	1635		Josh Neal	CDLP	helper
4/13	725	AM	1635		Jeff Jones	CDLP	Drilling
4/13	3:50	PM	500	PM	Heidi Blaschke	GSI	"

Date	Time IN	a.m./p.m.	Time OUT	a.m./p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc)
4/14	0720	a.m	1730	p.m.	Jason Miles	Hart Crowser	Field Observations
4/14	0730	AM	1730	p.m.	Paul Robinette	GSI	GCO
4/14	0735	AM	1730	p.m.	Jeff Jones	CDLP	Driller
4/14	0735	AM	1730	p.m.	Josh Neal	CDLP	Helper
4/14/11	0735	AM	1730	p.m.	K. Charles	CDLP	Helper
4/14/11	1045	AM	500	PM	RENÉ FUENTES	EPA	FIELD OVERSIGHT
4/14/11	1045	AM	500	PM	Shira Lynn	"	"
4/14/11	1100	AM	500	PM	Heidi Blasdell	GSI	"
4/14	2:00	PM	4:30	PM	S. Nwanzo	DEQ	"
4/15	0720	am	3:15	PM	J. Miles	HC	Field observations
4/15	0730	AM	3/5	PM	Paul Robinette	GSI	FIELD OBSERVATIONS
4/15	0810	AM	1200	1145	RENÉ FUENTES	EPA	FIELD OVERSIGHT
4/15	0810	AM	1200	1145	Shira Lynn	EPA	" "
4/15	0900	AM	1200	pm	Heidi	GSI	" "
4/16	0730	A	1530	P	N. Linn	CESI	MAP GUIDE/EXT
4/17	0830	A	1630	P	N. Linn	CESI	O&M
4/19	0800	A	1430	P	N. Linn	CCSI	MOVE DRUMS

Date	Time In	Time Out	Name	Name of Company	Purpose
6/8	1313	1500	Tim Skvotzki	Hart Crowser	Site Inspection
6/8	1313	1500	Celina Abercrombie	Hart Crowser	"
6/10/11	0857	16[illegible]	Jason [illegible]	Hart Crowser	low tide monitoring
6/10/11	930	16[illegible]	Troy Fowler	HC	low tide
6/10/11	"	1330	Chris		"

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
6/21/11	1630	PM	1652	PM	Jason Miles	HC	Check Fire Extinguishers
6/29/11	0805 ~~1657~~	am	1125	am	Jason Miles	HC	NAPL Measurements
6/29/11	0835	AM	1100	AM	Heidi Blaschke	GSI	"
6/29/11	0835	AM	1100	AM	Erin Carroll	GSI	"
7/5/11	0847	am	~~1125~~ 1130	AM	Jason Miles	HC	Fire Extinguisher insp
7/5/11	9:00	AM	1000	PM	Robert Hobson	Control Fire Sales & Service	Fire Extinguishers
7/22/11	0705	AM	30	AM	Jason Miles	HC	NAPL Measurements
08/05/11	0900	AM	1100	AM	Tim Skrotzki	HC	Technical Team Site Walk
8/5/11	0900	AM			Heidi Blaschke	GSI	
					Danny Reible	UT	
					Erin Carroll	GST	
					Rene Fuentes	EPA	
					Nancy Harney	EPA	
					Scott Manzano	DEQ	
					Albert Elliotts	Stratus	
					Brandy Humphreys	Grande Ronde	
					Mike Poulsen	DEQ	

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
8/9/11	1145	am	12:20	pm	J. Myers	HC	Back flow test
8/9/11	11:45	AM	12:20	P.M.	G. Ellis	All Seasons	Backflow Test
8/9/11	3:50	PM	5:30	PM	E. Carroll	GSI	PSU Field trip
8/9/11	4:00	Pm			Kyle Witt	PSU	"
8/9/11	4:00	pM			Tri Minh Hoang	PSU	"
8/9/11	4	pm			Tarika Hanawalt	PSU	"
"	"	"			Alan Flemming	"	"
8/9/11	4	pm			C. White	PSU	
8/9/11	4 Pm				Sean Dinsmore	PSU	" "
8/9/11	4PM				Spenser Kuroda	PSU	" "
8/9/11	4PM				Theo Melone	PSU	" " "
8/9/11	4Pm				Paul Her	PSU	PSU Field trip
8/9/11	4Pm				Shawn Sullivan	PSU	" "
8/9/11	4PM				Mary Jackson	PSU	"
8/9/11	4PM				Bill Fiel	PSU	"
8/9/11	4PM			PM	Melanie McCandless	PSU	"
8/9/11	4			"	K. RIDE	PSU	"

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
8-9	410	PM			SCOTT Fagan	PSU	PSU Field Trip
8/9	4:10	PM			Robert Thompson	PSU	"
8/9	4:10	PM			Nancy Cameron	PSU	"
8-11	8:15	AM	840	AM	Bob Hagel	Portland Fire	Fire Inspection
8-11	815	AM	840	AM	Tim Skrotzki	HC	Fire Inspection
8-15	1130	AM	1412	PM	Jason Miles	HC	Product levels
9-8	9:20	AM	12:35	PM	CELINA ABERCROMBIE	HC	Veg. monitoring
9-16	1045	AM	1316	PM	Jason Miles	HC	Product Levels
9-29	0800	AM	1600	PM	N. LEAN	CCSI	DISPOSAL
9/29	1330		1530	PM	T Fowler	HC	" "
9/30	0730	A	1330	P	N. LEAN	CCSI	" "
9/30	8:15	A	11:00	A	Cliff Wilson	Veolia ES	disposal
10/25	9:00	AM	1335		Chris Martin	HC	tide monitoring
10/25	9:00	AM	1335		Erin Carroll	GSI	low-tide monitoring
10/25	915	am	1335		Troy Fowler	HC	"
10/27	850	am	1240		J. Miles	HC	Data logger Maintenance
10/27	910	am	1240		Troy Fowler	HC	"

Site Visitation Record
McCormick and Baxter Creosoting Company
Portland, Oregon

SITE VISIT LOG

VISITORS AND WORKERS MUST CHECK IN AND OUT

Date	Time IN	a.m./ p.m.?	Time OUT	a.m./ p.m.?	Name	Name of Company, Agency, or Organization	Comment (Purpose of Visit, etc.)
11/23/11	830	a.m	1440	p.m	Jason Miles	Hart Crowser	Inventory of Equip
12/13/11	1:00	pm	1530	pm	Heidi Blischke	GSI	Site walk
"	"	"	1530	Pm	Scott Manzano	DEQ	"
"	"	"	1530	pm	Tim Skrotzki	Hart Crowser	"
12/14	830	AM	1115	AM	Chris Martin	Hart Crowser	Fence Repair
"	"	"	1115	"	Jimmy	west-mercer fence	" "

ATTACHMENT B
SEDIMENT CAP OBSERVATIONS

Included only on the O&M Report CD

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

3/9/2011

Site Observations Form - Sediment Cap
Weekly / Monthly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure.
high temp (weekly)	58°F
low temp (weekly)	46°F
wind (weekly)	14 MPH (SSW)
precipitation (weekly)	0.68 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	40 to 80 plus Feet.
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	Two of five buoys remaining, one tangled with wood debris
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:
Sheen Description	

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

6/8/2011

Site Observations Form - Sediment Cap
Weekly / Monthly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure.
high temp (weekly)	78°F
low temp (weekly)	59°F
wind (weekly)	Light wind 5 to 7 MPH
precipitation (weekly)	0.01 inches
Sheen Observations (see table below)	None Observed
Size and Location	N/A
Source (gas bubble, debris, etc.)	N/A
ACB and Riprap Armoring	High Water, not exposed
Changes in Location	N/A
Displaced blocks	N/A
Vandalism	None Observed
River relative to top of ACB	Above ACB
Organoclay Mats (extreme low water)	N/A
Edges of mats visible?	N/A
Overlying Armoring conditions	N/A
Evidence of movement?	N/A
WC OC/Seep Area	N/A
TFA OC/Seep Area	N/A
Wildlife	
Fish / Crayfish / clams	None Observed
Other	Geese
Warning Signs Condition	Good
Buoy Condition / Location	No buoys remain in place
cove shoreline (general)	High River/Good
FWDA shoreline (general)	High River/Good
bulkhead shoreline (general)	High River/Good
TFA shoreline (general)	High River/Good
observations or notes	Extremely high river levels, entire ACB underwater
Follow Up Inspection	☐ Yes ☐ No Date:
Sheen Description	

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

8/5/2011

Site Observations Form - Sediment Cap
Weekly / Monthly

tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure.
high temp (weekly)	84°F
low temp (weekly)	61°F
wind (weekly)	Light, 5 MPH
precipitation (weekly)	None
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	40 to 80 plus Feet.
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	No buoys remain in place
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:
Sheen Description	

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)
slight sheen observed in sand along southern shoreline of site	iron-related sheen	small areas in sand	no odor

Table 3.2
Example Sediment Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

12/13/2011

Site Observations Form - Sediment Cap
Weekly / Monthly

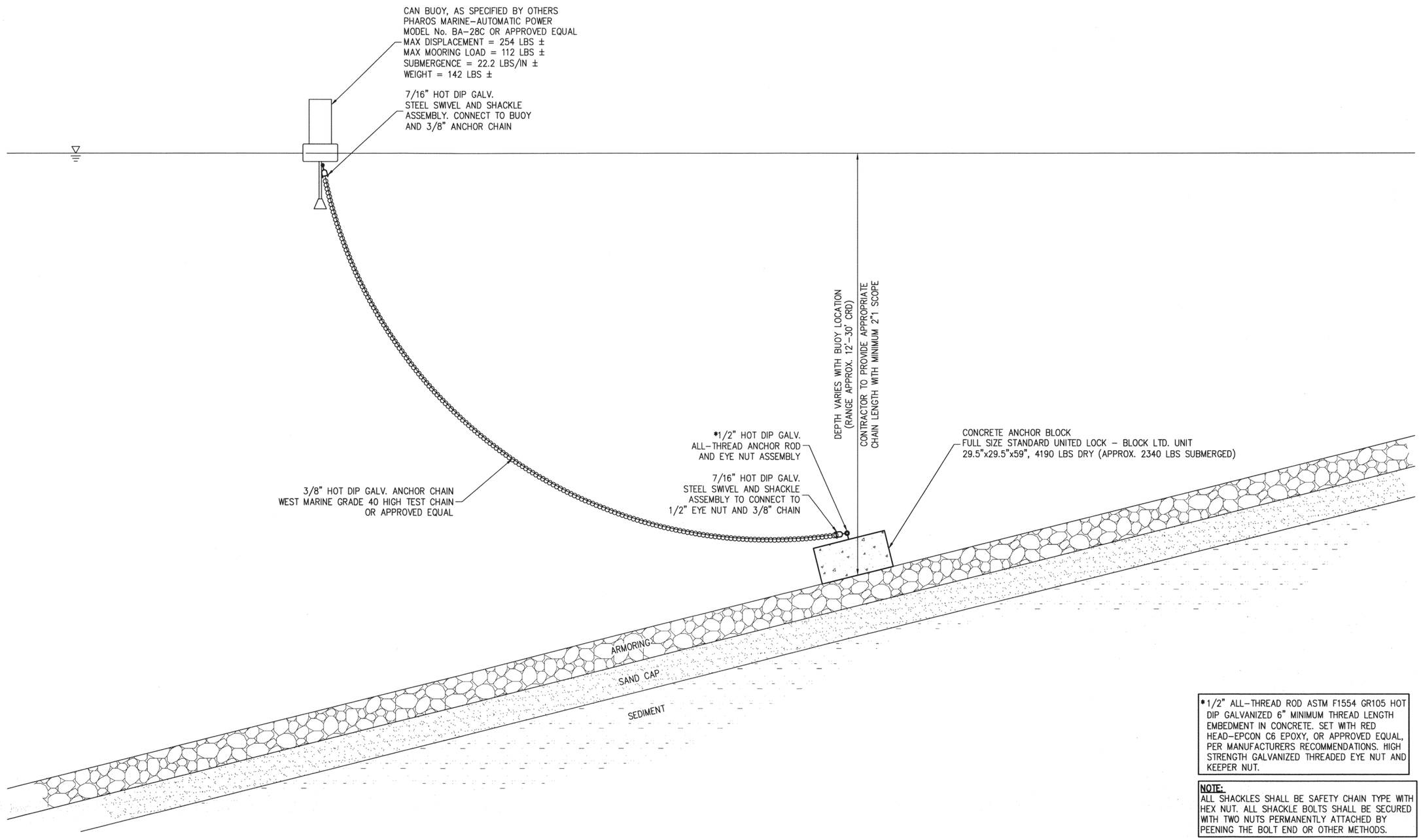
tbl_site_observations

Category	Observation
gate conditions (weekly)	All locked and secure.
high temp (weekly)	50°F
low temp (weekly)	35°F
wind (weekly)	Light wind 5 to 7 MPH
precipitation (weekly)	0.04 inches
Sheen Observations (see table below)	None Observed
Size and Location	None Observed
Source (gas bubble, debris, etc.)	None Observed
ACB and Riprap Armoring	Good
Changes in Location	Good
Displaced blocks	Good
Vandalism	None Observed
River relative to top of ACB	40 to 80 plus Feet.
Organoclay Mats (extreme low water)	None Observed
Edges of mats visible?	None Observed
Overlying Armoring conditions	Good
Evidence of movement?	None Observed
WC OC/Seep Area	Good
TFA OC/Seep Area	Good
Wildlife	
Fish / Crayfish / clams	Clams
Other	Birds
Warning Signs Condition	Good
Buoy Condition / Location	All five buoys in place and in good condition
cove shoreline (general)	Good
FWDA shoreline (general)	Good
bulkhead shoreline (general)	Good
TFA shoreline (general)	Good
observations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:
Sheen Description	

Location (TFA, FWDA, Willamette Cove) indicate if located on map and attach map	Character (NS, BS, SS, MS, HS)	Size and dimension (inches)	Odor (no odor, petroleum odor. creosote odor, other odor)

ATTACHMENT C
BUOY DESIGN DOCUMENTATION

Included only on the O&M Report CD



*1/2" ALL–THREAD ROD ASTM F1554 GR105 HOT DIP GALVANIZED 6" MINIMUM THREAD LENGTH EMBEDMENT IN CONCRETE. SET WITH RED HEAD–EPCON C6 EPOXY, OR APPROVED EQUAL, PER MANUFACTURERS RECOMMENDATIONS. HIGH STRENGTH GALVANIZED THREADED EYE NUT AND KEEPER NUT.

NOTE:
ALL SHACKLES SHALL BE SAFETY CHAIN TYPE WITH HEX NUT. ALL SHACKLE BOLTS SHALL BE SECURED WITH TWO NUTS PERMANENTLY ATTACHED BY PEENING THE BOLT END OR OTHER METHODS.

P | N | D
ENGINEERS, INC.
811 First Avenue, Suite 570
Seattle, Washington 98104
Phone: 206-624-1387
Fax: 206-624-1388
mail@pndengineers.com

REGISTERED PROFESSIONAL ENGINEER 14,127 OREGON JULY 26, 1985 WILLIAM GUNDERSON
EXPIRATION DATE: 6-30-2011

REVISIONS		
REV	DATE	DESCRIPTION

PROJECT:
NORTHWEST UNDERWATER CONST. LLC
CONCRETE BUOY DESIGN

TITLE:
ELEVATION

DESIGNED BY:	WJG	PROJECT NO:	104122.01	SHEET NO:	1 OF 1
DRAWN BY:	GRD	DATE:	APRIL 2011		
CHECKED BY:		SCALE:	NOTED		

4/13/11
Drawings\2010\104122.01 – NW Underwater Const. Buoy Anchors\Schematic Drawing\104122.01–01.dwg

P | N | D

811 First Avenue, Suite 570
Seattle, Washington 98104
phone 206.624.1387
fax 206.624.1388

Project: NORTHWEST UNDERWATER CONST. LLC
Sheet Number: 1 Of:
Calculated by: AJ Date: 4/12/2011
Checked by: CK Date: 4/12/2011

CONCRETE BUOY DESIGN

ANCHOR SYSTEM CABLE LOAD CALCULATIONS

1. VARIABLES AND DEFINITIONS

F_c = Force due to current in lbs

A = Area on which the current acts in sq-ft

C_D = Coefficient of drag or shape factor

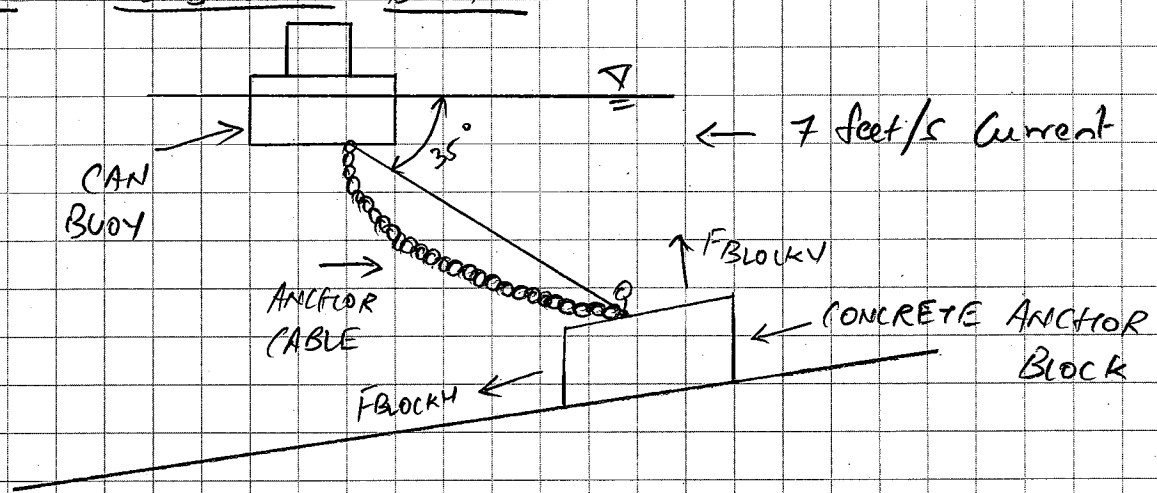
U = Current velocity in ft/s

W_{w} = Weight of water in lbs

F_{BLOCKH} = Horizontal force on anchor block in lbs

F_{BLOCKV} = Vertical force on anchor block in lbs

2. CASE 1 : UNSUBMERGED BUOY



P | N | D

811 First Avenue, Suite 570
Seattle, Washington 98104
phone 206.624.1387
fax 206.624.1388

Project: NORTHWEST UNDERWATER CONST. LLC
Sheet Number: 2 Of:
Calculated by: AJ Date: 4/12/2011
Checked by: CK Date: 4/12/11

$U = 7$ ft/s

$A = 14'' \times 28'' = 2.73$ sq. ft

$C_D = 1.2$

F_c (for fresh water) $= \frac{1}{2} C_D U^2 A \times \frac{\rho}{g}$

$= 1.2 \times 7^2 \times 2.73 \times \frac{62.4}{64}$

$= 156$ lbs

Force on the anchor cable $= 156 \div \cos\alpha$

$= 156 \div \cos 35°$

$= \boxed{190 \text{ lbs}}$

Horizontal force on the anchor block ($F_{BLOCK H}$) $= 190 \times \cos 55°$

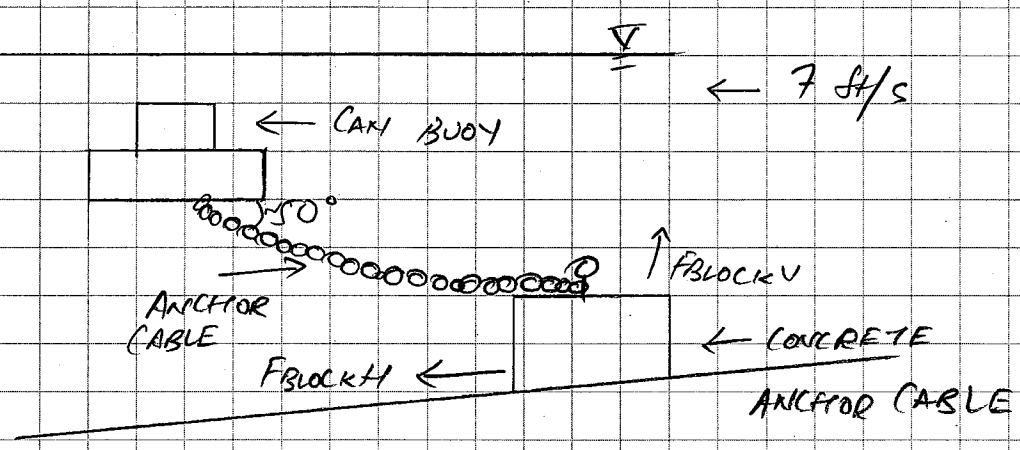
$= \boxed{109 \text{ lbs}}$

Vertical force on the anchor block ($F_{BLOCK V}$) $= 190 \times \sin 55°$

$= \boxed{156 \text{ lbs}}$

3. CASE 2 : SUBMERGED BUOY

CURRENT WITH SUBMERGED CASE CAUSES 50° ANGLE IN MOORING LINE



P | N | D

811 First Avenue, Suite 570
Seattle, Washington 98104
phone 206.624.1387
fax 206.624.1388

Project: NORTHWEST UNDERWATER CONST. LLC
Sheet Number: 3 Of:
Calculated by: AI Date: 4/12/2011
Checked by: CK Date: 4/12/11

Weight of buoy = 142 lbs

Weight of anchor = 45 lbs (Grade 40 @ 1.5, lbs, 30' lengths)

Weight of water = Volume of water displaced × density

$= 10.3\ ft^3 \times 62.4\ lb/ft^3$

$= 642$ lbs

Weight acting on the buoy = Weight of water − (weight of buoy + weight of anchor)

$= 642 - (142 + 45)$

$= \boxed{455\ lbs}$

Area of buoy exposed = $7.23\ ft^2$

Total force due to current = $7^2 \times 7.23 \times 1.2 \times 62.4/64$

$= 415$ lbs

The currents will push the buoy. The angle can be estimated by balancing the buoyancy and current forces.

$$\therefore \frac{455}{\sin\alpha} = \frac{415}{\cos\alpha} \Rightarrow \alpha = 48^\circ$$

Force acting on the anchor cable $= \dfrac{415}{\cos 48^\circ} = \boxed{620\ lbs}$

Horizontal force acting on the block $= 620 \times \cos 48^\circ = \boxed{415\ lbs}$

Vertical force acting on the block $= 620 \times \sin 48^\circ = 460$ lbs

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Project: NORTHWEST UNDERWATER CONST. LLC
Sheet Number: 4 Of:
Calculated by: AJ Date: 4/12/2011
Checked by: CK Date: 4/12/11

$$\frac{\text{Horizontal force}}{\text{buoyancy of block}} = \frac{495}{2340} = 0.2$$

Coefficient of friction μ for sliding block = 0.6

$\boxed{\text{OK}}$

ATTACHMENT D
SOIL CAP OBSERVATIONS

Included only on the O&M Report CD

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

3/9/2011

Site Observations Form - Soil Cap
Weekly/Monthly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None Observed
High temp (weekly)	58°F
Low temp (weekly)	46°F
Wind (daily)	14 MPH (SSW)
Precipitation (weekly)	0.68 inches
Erosion	Good
Around Manholes	Good
Headway retention pond	Good
Eastern edge of property	Good
Spillway area	Good
Outfall area	Fair, needs more rock placement
Animal burrows / disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole conditions	Good
Debris, flow, general condition	Significant flow, Approximately 30 GPM
Flow in collection piping	Significant flow, Approximately 30 GPM
Outfall and Spillway	
Note approx. flow volume	Significant flow, Approximately 30 GPM
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Birds, Geese
Daily activities	Site Inspection
Obsevations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

6/8/2011

Site Observations Form - Soil Cap
Weekly/Monthly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None Observed
High temp (weekly)	78°F
Low temp (weekly)	59°F
Wind (daily)	Light wind 5 to 7 MPH.
Precipitation (weekly)	0.01 inches
Erosion	Good
Around Manholes	Minor erosion observed: Ground squirrel burrows
Headway retention pond	Good
Eastern edge of property	Good
Spillway area	Good
Outfall area	Good
Animal burrows / disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole conditions	Good
Debris, flow, general condition	Minimal flow
Flow in collection piping	Minimal flow
Outfall and Spillway	
Note approx. flow volume	Minimal flow, approximately 5 GPM
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Osprey, ground squirrels
Daily activities	Site Inspection
Obsevations or notes	
Follow Up Inspection	**No**

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

8/5/2011

Site Observations Form - Soil Cap
Weekly/Monthly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None Observed
High temp (weekly)	84°F
Low temp (weekly)	61°F
Wind (daily)	Light, 5 MPH
Precipitation (weekly)	None
Erosion	Good
Around Manholes	Good
Headway retention pond	Good
Eastern edge of property	Good
Spillway area	Good
Outfall area	Fair, needs more rock placement
Animal burrows / disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole conditions	Good
Debris, flow, general condition	No Flow
Flow in collection piping	No Flow
Outfall and Spillway	
Note approx. flow volume	No Flow
Sprinkler System	In place but not in use
Vegetation Conditions	Fair
Wildlife	Birds, Geese
Daily activities	Site Inspection
Obsevations or notes	
Follow Up Inspection	☐ Yes ☐ No Date:

Table 3.1
Example Soil Inspection Form
McCormick and Baxter Creosoting Company
Portland, Oregon

12/13/2011

Site Observations Form - Soil Cap
Weekly/Monthly

tbl_site_observations

Category	Observation
Gate Conditions (weekly)	All locked and secure
perimeter fence (weekly)	Good
trespassers, entry point	None Observed
High temp (weekly)	50°F
Low temp (weekly)	35°F
Wind (daily)	Slight wind 5 to 7 mph
Precipitation (weekly)	0.04 inches
Erosion	Good
Around Manholes	Good
Headway retention pond	Good
Eastern edge of property	Good
Spillway area	Good
Outfall area	Fair, needs more rock placement
Animal burrows / disturbance	Old squirrel holes near buildings, extra ACB, and randomly throughout site
Manhole conditions	Good
Debris, flow, general condition	Moderate flow, Approximately 8 GPM
Flow in collection piping	Moderate flow, Approximately 8 GPM
Outfall and Spillway	
Note approx. flow volume	Moderate flow, Approximately 8 GPM
Sprinkler System	In place but not in use
Vegetation Conditions	Good
Wildlife	Birds, Geese
Daily activities	Site Inspection
Obsevations or notes	Upland fence damaged and sign damaged.
Follow Up Inspection	☐ Yes ☐ No Date:

ATTACHMENT E
QUARTERLY MEETING SUMMARIES

Included only on the O&M Report CD

McCormick & Baxter Operational & Functional Determination Period Status Meeting Report

Tuesday, March 10, 2011
11:00 AM
6900 N Edgewater Street
Portland, OR 97203

Meeting called by:	Oregon Department of Environmental Quality (DEQ)	Type of Meeting:	Monthly Progress Meeting
Facilitator:	Heidi Blischke	Note Taker:	Tim Skrotzki
Attendees:	Scott Manzano	Project Officer	DEQ
	Heidi Blischke	Technical Manager	GSI
	Tim Skrotzki	Field Manager	Hart Crowser

Monthly Progress Meeting Notes

Site Walk and Inspection

Representatives from Hart Crowser, DEQ, and GSI conducted a visual inspection of the shoreline and upland site on Wednesday, March 9, 2011. Newt Linn, of Clearwater Environmental, completed a thorough inspection of the entire site on Wednesday, March 9, 2011. The next inspection is scheduled for June 2011.

Site Walk – Shoreline

The following items were inspected during both the shoreline site walk and inspection:

- Inspection of the McCormick and Baxter shoreline conditions.
- Inspection of the McCormick and Baxter stormwater discharge.
- Inspection of buoy locations.

The Willamette River level at the time of the inspection (~11:00 AM) was approximately 14 feet NAVD88 (high tide) with high tide at 12:00PM and low tide at 8:00PM; thus, observations were made during high tide. The river levels are about the same as those observed in December 2010. An abandoned transient structure composed of drift wood was observed along the shoreline. Clearwater Environmental disassembled the structure on March 10, 2011.

Significant stormwater discharge was observed in March 2011 (~30 gallon per minute) due to heavy rain.

Currently only one of five buoys (Willamette Cove) remain in place and one was tangled with wood debris. All buoys will be replaced in 2011.

Site Walk – Upland

The following items were inspected during the upland site walk and inspection:

- Inspection of the soil cap.
- Inspection of monitoring well MW-23d.
- EW-1s well-seal and one-way gas release valve.

The distance between the inner casing and outer casing on MW-23d was measured at 2.55 inches similar to observations in December 2010.

Action Items:	Person Responsible	Deadline
Monitor stormwater discharge.	Newt Linn	Quarterly
Monitor inner/outer casing MW-23d	Tim Skrotzki	Quarterly
Site Inspections	Newt Linn	Quarterly
Download EW-1s transducer data	Tim Skrotzki	Semi-Annual

Site Activities / Miscellaneous Field Activities

NAPL Recovery: Weekly NAPL thickness measurements and recovery were completed from mid-December through early March 2011. Consistent with previous removal results the majority of NAPL was removed from monitoring well MW-20i. DNAPL was also removed from EW-1s within the barrier wall when present.

Inner/outer Casing Movement at MW-23d: The distance between the inner casing and outer casing on MW-23d measured on March 10, 2011 was 2.55 inches. No movement was observed between August and March 2011.

NAPL Data Gap Investigation: A revised Data Gap Investigation Work Plan was submitted to the DEQ and EPA on March 8, 2011. Sewer line pot holing was completed on March 10, 2011. The sewer line was not located, additional sewer locating activities are scheduled for late March 2011. Sonic drilling is scheduled to begin April 11, 2011.

Buoy Placement. The buoy design and installation contactor (Northwest Underwater Construction) is currently designing buoys for Hart Crowser approval. The permit to install the buoys was issued by the US Coast Guard in late March 2011. Additionally, DEQ must determine if buoys can be placed in Spring 2011 or if we need to wait for the Oregon Department of Fish and Wildlife window to protect wildlife (expected July 2011).

Activities for Subsequent Period: Weekly NAPL gauging including extraction from EW-1s.

Action Items	Person Responsible:	Deadline:
Additional Sewer Line Pot Holing	Tim Skrotzki	Late March 2011
Data Gap Sonic Drilling	Tim Skrotzki	April 11, 2011
Buoy Design	Tim Skrotzki	Early April 2011
Fish and Wildlife Window Determination	Scott Manzano	April 2011
Monthly subsidence observations.	Tim Skrotzki	Quarterly
Site Inspections	Newt Linn	Quarterly

Deliverables

NAPL Data Gap Investigation Scope of Work: Hart Crowser/GSI submitted a Final NAPL Data Gap Investigation Scope of Work Memorandum to the DEQ/EPA on November 27, 2010.

ACB Investigation Sampling and Analysis Plan: Hart Crowser/GSI submitted an ACB Investigation Sampling and Analysis Plan to the DEQ on December 1, 2010.

NAPL Data Gap Investigation Work Plan: Hart Crowser/GSI submitted a revised NAPL Data Gap Investigation Work Plan to the DEQ/EPA on March 8, 2011.

Budget		
Budget Status: December 2010 through February 2011 were at/or below the anticipated budget; however, Data Gap Investigation sewer line pot holing and pump testing was not included in the previous budget. A new Budget and Assumptions Proposal (BAP) to complete site O&F activities (including pot holing and pump test activities) from April through September 2011 is being prepared. Currently sufficient funds exist to initiate Data Gap Investigation activities.		
Meeting Status: No meetings will be held in April or May 2011. The next progress meeting is tentatively scheduled for Tuesday, June 21, 2011.		
Date / Time	Tentatively; Tuesday, June 21, 2011	9:00 AM
Location	McCormick & Baxter Facility	Site Office

McCormick & Baxter Operational & Functional Determination Period Status Meeting Report

Friday, June 10, 2011
2:00 PM
6900 N Edgewater Street
Portland, OR 97203

Meeting called by:	Oregon Department of Environmental Quality (DEQ)	Type of Meeting:	Monthly Progress Meeting
Facilitator:	Heidi Blischke	Note Taker:	Tim Skrotzki
Attendees:	Scott Manzano	Project Officer	DEQ
	Heidi Blischke	Technical Manager	GSI
	Tim Skrotzki	Field Manager	Hart Crowser

Monthly Progress Meeting Notes

Site Walk and Inspection

Tim Skrotzki, of Hart Crowser, completed a thorough inspection of the entire site on Wednesday, June 8, 2011. The next inspection is scheduled for August 2011.

Site Walk – Shoreline

The following items were inspected during both the shoreline site walk and inspection:

- Inspection of the McCormick and Baxter shoreline conditions.
- Inspection of the McCormick and Baxter stormwater discharge.
- Inspection of buoy locations.

The Willamette River level at the time of the inspection (~1:00 PM) was approximately 16 feet NAVD88; tidal influence is currently negligible due to high river levels (near flood stage). Entire ACB covered by river, but still well below barrier wall. Minimal damage/erosion due to high water to vegetation in riparian area observed.

Moderate discharge from the stormwater outfall was observed consistent with recent mild weather conditions.

Currently no buoys remain in place due to high river levels. All buoys will be replaced in July 2011.

Site Walk – Upland

The following items were inspected during the upland site walk and inspection:

- Inspection of the soil cap.
- Inspection of monitoring well MW-23d.
- EW-1s well-seal and one-way gas release valve.

The distance between the inner casing and outer casing on MW-23d was measured at 2.56 inches similar to observations in December 2010 and March 2011.

Action Items:	**Person Responsible**	**Deadline**
Monitor stormwater discharge.	Tim Skrotzki	Quarterly
Monitor Subsidence (i.e., MW-23d movement)	Tim Skrotzki	Quarterly
Site Inspections	Tim Skrotzki	Quarterly
Download EW-1s transducer data	Tim Skrotzki	Semi-Annual

Site Activities / Miscellaneous Field Activities

NAPL Data Gap Investigation: NAPL Data Gap Investigation drilling was completed from April 11 through 15, 2011. Minimal product was observed in soil cores adjacent to monitoring well MW-20i. A NAPL Data Gap Report will be completed in July 2011.

NAPL Recovery: Based on NAPL Data Gap Investigation results, the EPA and DEQ have terminated NAPL recovery efforts outside of the barrier wall. Two NAPL gauging events were completed in May 2011, two are scheduled for June 2011, and one in July 2011 to monitor NAPL thickness post-removal. Long-term NAPL monitoring will be discussed at the Annual Technical Team Meeting in August 2011.

Waste Disposal: WasteXpress of Portland, Oregon, was chosen for hazardous waste disposal services through a competitive bid process in May 2011. It is anticipated all waste will be disposed of as hazardous waste; however, waste characterization samples are necessary to determine the disposal method. Waste disposal characterization samples were collected on June 10, 2011. Samples are being analyzed for dioxins, phenols, and metals. Waste disposal is anticipated to be completed in late July 2011.

Noxious Weed Control: Native Ecosystems NW completed semi-annual noxious weed control activities including herbicide application and manual pulling from April 18 through 22, 2011.

Vegetation Management: Celina Abercrombie (Hart Crowser ecologist) completed semi-annual vegetation inspection on June 8, 2011. Vegetation is generally consistent with coverage and species specified by the City of Portland in 2009/2010. High river levels appear to be causing minor damage/erosion of green erosion matting above the ACB. An additional, assessment of this area will be made when river levels recede (likely July 2011).

Buoy Placement. The buoy design and installation contactor (Northwest Underwater Construction) has completed buoy design. Buoys will be installed in July 2011 in accordance with the Oregon Department of Fish and Wildlife window to protect wildlife.

Activities for Subsequent Period: Periodic NAPL gauging including extraction from EW-1s.

Action Items	**Person Responsible:**	**Deadline:**
NAPL Gauging	Tim Skrotzki	Bi-weekly through July 2011
Waste Disposal	Tim Skrotzki	July 2011
Follow-up Shoreline Inspection	Tim Skrotzki	July 2011
Buoy Installation	Tim Skrotzki	July 2011

Deliverables

2010 Operations and Maintenance (O&M) Report: The draft 2010 O&M Report was submitted to the DEQ in May/June 2011. The final 2010 O&M Report was submitted to the Technical Team on June 27, 2011.

NAPL Data Gap Investigation Report: The draft NAPL Data Gap Investigation Report will be prepared by Hart Crowser/GSI in June/July 2011.

5-Year Review Documentation: 5-Year Review documentation and data interpretation will be provided by Hart Crowser/GSI for the DEQ and EPA in August 2011.

Action Items	Person Responsible:	Deadline:
NAPL Data Gap Investigation Report	Heidi Blischke	August 2011
5-Year Review Documentation	Heidi Blischke	August 2011
Budget		
Budget Status: March through June 2011 were at/or below the anticipated budget.		
Meeting Status: No meeting will be held in July or August 2011. The next progress meeting is tentatively scheduled for Tuesday, September 13, 2011.		
Date / Time	Tentatively; Tuesday, September 13, 2011	9:00 AM
Location	McCormick & Baxter Facility	Site Office

McCormick & Baxter Operational & Functional Determination Period Status Meeting Report

Tuesday, December 13, 2011
1:00 PM
6900 N Edgewater Street
Portland, OR 97203

Meeting called by:	Oregon Department of Environmental Quality (DEQ)	Type of Meeting:	Monthly Progress Meeting
Facilitator:	Heidi Blischke	Note Taker:	Tim Skrotzki
Attendees:	Scott Manzano	Project Officer	DEQ
	Heidi Blischke	Technical Manager	GSI
	Tim Skrotzki	Field Manager	Hart Crowser

Monthly Progress Meeting Notes

Site Walk and Inspection

Tim Skrotzki, Scott Manzano, and Heidi Blischke, completed a thorough inspection of the entire site on Tuesday, December 13, 2011. The next inspection is scheduled for March 2012.

Site Walk – Shoreline

The following items were inspected during both the shoreline site walk and inspection:

- Inspection of the McCormick and Baxter shoreline conditions.
- Inspection of the McCormick and Baxter stormwater discharge.
- Inspection of buoy locations.

The Willamette River level at the time of the inspection (~1:00 PM) was approximately 5 feet NAVD88 with high tide at 11:00AM and low tide at 4:00PM; thus, observations were made during an incoming tide. A minimal amount of debris was observed along the shoreline. Two houseboats were observed in Willamette Cove anchored north of the sediment cap. Warning buoys appeared to be in good condition.

Moderate discharge from the stormwater outfall was observed consistent with mild weather conditions.

Site Walk – Upland

The following items were inspected during the upland site walk and inspection:

- Inspection of the soil cap.
- Inspection of monitoring well MW-23d.
- EW-1s well-seal and one-way gas release valve.

The distance between the inner casing and outer casing on MW-23d is 2.58 inches. This is 0.02 inches more than in June 2011, indicating the ground surface remains unstable in this location.

Action Items:	**Person Responsible**	**Deadline**
Monitor stormwater discharge.	Tim Skrotzki	Quarterly
Monitor Subsidence (i.e., MW-23d movement)	Tim Skrotzki	Quarterly
Site Inspections	Tim Skrotzki	Quarterly
Download EW-1s transducer data	Tim Skrotzki	Semi-Annual

Site Activities / Miscellaneous Field Activities

NAPL Gauging: Monthly NAPL gauging events were completed on June 29, July 22, August 15, and September 16, 2011. NAPL monitoring will be conducted semi-annually in 2012 only during low-tide monitoring events.

Annual Technical Team Meeting: The Annual Technical Team meeting was completed on August 4 and 5, 2011. As part of the annual meeting a site inspection walk was completed by the Technical Team on August 5, 2011.

Buoy Placement. Five new navigation warning buoys were installed on the sediment cap by Northwest Underwater Construction on August 12, 2011.

Vegetation Inspection: Celina Abercrombie (Hart Crowser biologist) completed semi-annual vegetation inspection on September 8, 2011. Vegetation is generally consistent with previous coverage and species. The irrigation system is no longer needed and will be decommissioned in 2012.

IDW Disposal: Hazardous waste disposal of five 55-gallon drums of IDW soil, seventeen 55-gallon drums purge water/NAPL, and five 1-cubic yard totes of debris was completed by Veolia ES on September 30, 2011. One 55-gallon drum of IDW soil could not be transported for disposal due to prior damage that occurred while moving the drum from the shoreline to the waste storage area. Soil from this drum will be loaded into a new drum and disposed of in 2012 under the new task order (No. 59-08-43) with any additional waste at the site.

Noxious Weed Control: Native Ecosystems NW completed semi-annual noxious weed control activities including herbicide application and manual pulling from October 18 through 21, 2011.

Low-Tide Monitoring: Low-tide monitoring water level measuring activities were completed on October 25, 2011, and transducer download activities were completed on October 27, 2011. A low-tide monitoring reduction plan is currently being produced and will be implemented in Spring 2012.

Equipment Decommissioning: Equipment decommissioning activities consisting of updating the equipment list for the site, photographing each piece of equipment, and assessing its condition was completed on November 22 and 23, 2011.

Activities for Subsequent Period: Transducer removal from wells that no longer will be monitored in accordance with the low-tide monitoring reduction plan. Continued equipment decommissioning activities.

Action Items	Person Responsible:	Deadline:
ACB Habitat Gravel Placement Approval	Scott Manzano	Spring 2012
Transducer Removal	Tim Skrotzki	Spring 2012
Subsidence Observations	Tim Skrotzki	Quarterly
Site Inspections	Tim Skrotzki	Quarterly

Deliverables

2010 Operations and Maintenance (O&M) Report: The Final 2010 Operation and Maintenance (O&M) Report was submitted to the Technical Team on June 27, 2011. During preparation of the Third Five-Year Review errors were discovered in the 2010 O&M Report. A Revised 2010 O&M Report was submitted to the Technical Team on December 7, 2011.

Third Five-Year Review Report: The Final Third Five-Year Review Report was submitted to the DEQ and EPA on September 26, 2011.		
Action Items	**Person Responsible:**	**Deadline:**
O&M Plan	Heidi Blischke	Late January 2012
Equipment Decommissioning Plan	Tim Skrotzki	February 2012
Budget		
Budget Status: For July through December 2011, preparation activities for the Third Five-Year Review Report exceeded its budget, however, the project overall was below the anticipated budget.		
Meeting Status: The next progress meeting is tentatively scheduled for Tuesday, March 13, 2012.		
Date / Time	Tentatively; Tuesday, March 13, 2012	9:00 AM
Location	McCormick & Baxter Facility	Site Office

ATTACHMENT F
PHOTOGRAPH DOCUMENTATION

OPERATION AND MAINTENANCE REPORT
JANUARY 2011 TO DECEMBER 2011
MCCORMICK AND BAXTER SUPERFUND SITE
PORTLAND, OREGON

Photograph 1 – June 2011 high river event (2 feet below flood stage). Photograph taken looking northwest.

Photograph 2 – Erosion matting exposed due to high water (June 2011).

Photograph 3 – Erosion matting intact after high water. Vegetation growing back on matting (December 2011). Photograph taken looking southeast.

Photograph 4 – Shoreline vegetation above ACB not affected by high water. Photograph taken looking south (December 2011).

OPERATION AND MAINTENANCE REPORT
JANUARY 2011 TO DECEMBER 2011
MCCORMICK AND BAXTER SUPERFUND SITE
PORTLAND, OREGON

Photograph 5 – Accumulated wood debris during the June 2011 high river event. City of Portland outfall area. Photograph taken looking southwest.

Photograph 6 – Canadian geese and gulls along the M&B shoreline. Photograph taken looking south (December 2011).

Photograph 7 – Buoys prior to installation with galvanized steel chain and United States Coast Guard demarcations (July 2011).

Photograph 8 – Buoy installation by Northwest Underwater Construction. Photograph taken looking north (July 2011).

Photograph 9 – Buoys installed in Willamette Cove (July 2011).

Photograph 10 – Transient structure in TFA area. Subsequently, dismantled by Clearwater. Photo taken looking south (March 2011).

Photograph 11 – Transient house boat beached in Willamette Cove. House boat subsequently removed from beach. Photograph taken looking east (July 2011).

Photograph 12 – Transient house boats anchored in Willamette Cove. Photograph taken looking east (December 2011).

Photograph 13 – Fence damage by trespassers. Photograph taken looking east (December 2011).

Photograph 14 – Fence damage by trespassers. Photograph taken looking northeast (December 2011).

Photograph 15 – Sign damage due to trespassers. Photograph taken facing southeast (December 2011).

Photograph 16 – Stormwater conveyance system discharge (March 2011).

Photograph 17 – Repaired fence northwest corner of Site (June 2011).

APPENDIX C
VEGETATION MANAGEMENT

OPERATION AND MAINTENANCE REPORT
JANUARY 2011 THROUGH DECEMBER 2011

Hart Crowser/GSI
15670-06/Task 5 May 23, 2012

APPENDIX C
CONTENTS

FIGURE

ATTACHMENT

ACRONYMS

BES	City of Portland Bureau of Environmental Services
NOAA	National Oceanographic and Atmospheric Administration
Site	McCormick & Baxter Superfund Site

APPENDIX C
VEGETATION MANAGEMENT
OPERATION AND MAINTENANCE REPORT
JANUARY 2011 THROUGH DECEMBER 2011
MCCORMICK AND BAXTER SUPERFUND SITE

1.0 INTRODUCTION

This Appendix to the *January 2011 through December 2011 Operation and Maintenance Report* summarizes the 2011 vegetation management activities at the McCormick and Baxter Superfund Site (Site). Vegetation management activities on the upland cap were conducted in accordance with the *McCormick and Baxter Vegetation Management Plan* dated August 16, 2011 (Hart Crowser/GSI, 2011). The location of the Site, the Site layout, and surface elevations are shown on Figures 1 through 3 in the main section of the O&M Report.

The upland cap is comprised of five distinct components; each with corresponding goals and objectives for management of hydrology, soils, and wildlife habitat. These components are:

- Entrance Area;
- Impermeable Cap;
- Riparian Area;
- Stormwater Retention Pond and Drainage Swale; and
- Earthen Cap.

Vegetation management components are shown on Figure C-1.

2.0 BACKGROUND

The upland cap at the Site was constructed over a two year period. In 2004, a 6-acre soil cap was constructed on a regraded river bank (riparian area), as part of constructing the in-water sediment cap. In 2005, a 34-acre multiple-component designed soil cap was constructed to complete the upland cap at the Site. The City of Portland, Bureau of Environmental Services (BES) entered into an Intergovernmental Agreement (IGA) with the Oregon Department of Environmental Quality to provide vegetation planning and vegetation management services for the upland cap from 2005 through 2010. In

February 2006, the soil cap was planted with native grasses, plants, and trees, and an irrigation system was installed. After the fifth growing season, BES determined that the vegetation was fully established and the irrigation system was no longer needed.

The goal of the bank layback (riparian area) and plantings was to create habitat elements such as large wood material, riparian vegetation for food, habitat cover and shelter, and shading (NOAA, 2004). Performance standards to assess whether the planting goals in the DEQ/BES IGA for the entire upland cap are met include the following:

- Bare soil spaces are small and well dispersed;
- Soil movement, such as active rills or gullies and soil deposition around plants or in small basin, is absent or slight and local;
- Plant litter is well distributed and effective in protecting the soil with few or no litter dams present;
- Native woody and herbaceous vegetation, and germination microsites, are present and well distributed across the site;
- Vegetation structure is resulting in rooting throughout the available soil profile;
- Plants have normal, vigorous growth form, and a high probability of remaining vigorous, healthy and dominant over undesired competing vegetation;
- Streambanks have less than 5% exposed soils with margins anchored by deeply-rooted vegetation or coarse-grained alluvial debris; and
- A continuous corridor of shrubs and trees provide shade for the entire streambank.

Overall, the planting and vegetation management goals have been met. The irrigation system and piping has been inactive since 2009 and is scheduled for decommissioning in 2012. Semi-annual noxious weed control activities, including herbicide application, were conducted by BES from Spring 2006 through Spring 2010. A private subcontractor (Native Ecosystems Northwest) provided herbicide services in Fall 2010, and Spring and Fall 2011. Vegetation management for the Site was conducted by Hart Crowser in 2011.

Rodents that inhabit the cap have damaged vegetation in the past; however, with the exception of some earlier targeted damage to the grand fir seedlings

(BES, 2010), there has been insignificant damage to other plantings. Rodent activities are monitored during quarterly Site inspections (Photograph 1).

3.0 BASELINE CONDITIONS

On June 10, 2011, a Hart Crowser ecologist inspected the upland cap to confirm the vegetation conditions discussed in the final 2010 BES Revegetation Assessment Report. The inspection included visual observation of vegetation planting areas, species identification (native, non-native, and invasive), growth, density, general coverage, and relative health of vegetation throughout the Site. Photograph documentation of the inspection was completed to establish a baseline to evaluate the progress of future vegetation treatments and the qualitative observations at select Site locations (Attachment A). These locations or "Photo Stations" are shown on Figure 1. The following summarizes baseline conditions and observations at the Site.

3.1 Upland Area

The Upland Area is divided into three components – the earthen cap, stormwater retention pond/drainage swale, and the impermeable cap. A variety of native trees, shrubs, and herbaceous species are present on the earthen cap (Photo Stations 1, 2, 3, and 5). Native shrubs and herbaceous species are present in stormwater retention pond and drainage swale (Photo Station 4). Meadow grasses and herbs are present on the impermeable cap (Photo Stations 6 and 7).

The earthen cap was originally planted with a variety of native trees, shrubs, and grasses including: Garry oak (*Quercus garryana*), Ponderosa pine (*Pinus ponderosa*), madrone (*Arbutus menziesii*), snowberry (*Symphoricarpos albus*), blue elderberry (*Sambucus cerulea),* Oregon-grape (*Mahonia aquifolium*), Nootka rose (*Rosa nutkana*), red-flowering currant (*Ribes sanguineum*), oceanspray (*Holodiscus discolor*), serviceberry (*Amelanchier alnifolia*), and mock orange (*Philadelphus lewisii*). Herbaceous species installed on the earthen cap included: chewings fescue (*Festuca rubra var. comutata*), California brome (*Bromus carinatus*), meadow barley (*Hordeum brachyantherum*), slender hairgrass (*Deschampsia elongata*), Spanish clover (*Lotus purshiana*), claria (*Clarkia amoena*), globe gilia (*Gilia capitata*), meadow checkermallow (*Sidalcea campestris*), large-leaved lupine (*Lupinus polyphullus*), and Canada goldenrod (*Solidago Canadensis*). These plant varieties remain on the earthen cap and were observed to be well established and growing both vertically and laterally. Some plant varieties have become more prolific than others, however, no indications of stress to specific plants was noted. Localized areas of moss were

observed within the grasses and herbaceous vegetation. Small quantities of knapweed and thistle were also present.

The stormwater retention pond and drainage swale were planted with a native shrub overstory consisting of hardhack (*Spiraea douglasii*), Sitka willow (*Salix sitchensis*), and Piper's willow (*Salix piperi*) (Photograph 2). Volunteer red alder (*Alnus rubra*) and black cottonwood (*Populus balsamifera*) were observed among the shrub plantings. Understory herbaceous species were installed based on anticipated inundation within the pond and swale area and included: water plantain (*Alisma plantago aquatica*), slough sedge (*Carex obnupta*), soft stem bulrush (*Scirpus tabernaemontanii*), small-fruited bulrush (*Scirpus microcarpus*), Western sloughgrass (*Beckmania syzigachne*), Western mannagrass (*Glyeria occidentalis*), tufted hairgrass (*Deschapsia cespitosa*), slender hairgrass, meadow barley, spike bentgrass (*Agrostis exerata*), meadow foxtail (*Alopecuris geniculatus*), self heal (*Prunella vulgaris*), Spanish clover, and gumweed (*Grindelia integrifolia*). The shrub plantings in the pond and swale area were well established and appeared healthy. Many of the grasses and herbs in the pond area did not survive as the infiltration of surface runoff limits moisture and the understory is dominated by sand and bare ground. As shrubs are well established, the area is flat, and erosion is generally not occurring replanting grasses and herbs is not recommended. No noxious weeds were observed in this area.

The impermeable cap was seeded with a grassland mixture including: chewings fescue, California brome, meadow barley, slender hairgrass, large-leaved collomia (*Collomia grandiflora*), globe gilia, large-leaved lupine, and Canada goldenrod. Grassland species provide excellent cover of the impermeable cap. Moss is present in localized areas in this zone where grasses and herbs did not become established. Small quantities of knapweed (*Centaurea Sp.*), thistle (*Cirsium arvense*), and skeletonweed (*Chondrilla juncea*) were present within the southwestern portion of this zone and did not appear to be encroaching on desirable vegetation.

In general, the Upland Area components appeared to be performing well with the installed trees and shrubs looking healthy and spreading on the earthen cap, shrubs well established within the pond and swale area, and good soil coverage and vegetative diversity on the impermeable cap. Groundcover species provided excellent coverage of the ground with the exception of a few areas containing bare ground and the relatively bare understory in the pond area. Limited quantities of noxious weeds were observed in the Upland area and were primarily limited to the southwestern edge of the impermeable cap.

3.2 Riparian Area

The Riparian Area is divided into two components – upper and lower. Each of these areas received similar vegetation treatments (Photo Stations 8 and 9). The lower component is subject to Willamette River elevation fluctuations, which influence vegetation conditions at its lower edge during high water events.

The lower component was originally planted with a variety of native trees and shrubs including: Oregon ash (*Fraxinus latifolia*), black hawthorn (*Crataegus suksdorfii*), cascara (*Rhamnus purshiana*), hardhack, red-osier dogwood (*Conus sericea*), Pacific ninebark (*Physocarpus capitatus*), swamp rose (*Rosa pisocarpa*), river willow (*Salix fluviatilis*), Sitka willow, rigid willow (*Salix rigida*), Piper's willow, and black twinberry (*Lonicera involucrata*). Groundcover species installed in the lower Riparian area included: California brome, blue wildrye (Elymus glaucus), meadow barley, slender hairgrass, spike bentgrass, globe gilia, lupine (*Lupinus albicaulis*), and Canada goldenrod. No tree plantings were installed at lower elevations in this area considering the potential for late season inundation due to high river levels. Instead, appropriate shrubs, primarily willows, were installed along the lower edge of this component to provide food and shade. A significant quantity of large wood debris was observed along the entire length of the lower edge. Trees and shrubs within the lower component were observed to be well established and growing both vertically and laterally. No indications of stress were noted. Localized areas of exposed turf reinforced matting were observed along the length of the lower edge, likely as a result of river fluctuations and movement of large wood along the lower shoreline. Thistle was the most common noxious weed with lesser quantities of knapweed and butterfly bush (*Buddleia davidii*) present.

The upper component was also planted with native vegetation including: red alder (*Alnus rubra*), big-leaf maple (*Acer macrophyllum*), Western redcedar (*Thuja plicata*), madrone, grand fir (*Abies grandis*), Garry oak (*Quercus garryana*), Oregon ash, black hawthorn, cascara, red elderberry (*Sambucus racemosa*), blue elderberry, Nootka rose, tall Oregon-grape, snowberry, red-flowering currant, oceanspray, red-osier dogwood, twinberry, and Pacific ninebark. Groundcover species in this area are identical to the lower component. Similar to the lower component, trees and shrubs are well established and appeared healthy. Few areas containing bare ground were observed. Thistle and knapweed were present in small quantities among the groundcover plantings throughout the area.

In general, the Riparian Area components appeared to be performing well with the installed trees and shrubs looking healthy and spreading. Groundcover species provided relatively good coverage of the soil with the exception of a few

areas containing bare ground and observed TRM along the shoreline. In addition, large wood was present throughout the lower component and in smaller quantities within the upper component. Thistle, knapweed, and butterfly bush continue to grow within the area.

4.0 FALL INSPECTION SUMMARY

On September 8, 2011, the Hart Crowser ecologist conducted a field inspection to document vegetation conditions on the Site. Qualitative data was recorded on species composition, cover and density of vegetation, growth and vigor, and effectiveness of noxious weed treatments. Photographs from select Photo Stations during the fall inspection are paired with photographs from the June baseline inspection for a qualitative assessment of the Site (Attachment A). Photo Stations are shown on Figure 1. Observations are summarized below.

4.1 Upland Area

Tree and shrub plantings on the earthen cap were healthy and growing well (Photograph 3). Ponderosa pine, Oregon-grape, elderberry, and serviceberry were performing the best. Trees and shrubs ranged from approximately 5 to 7 feet in height. Herbaceous species provided full coverage of the ground (Photograph 4). No indications of stress were observed. Localized areas of moss were observed among the herbaceous layer. Small quantities of knapweed and thistle were present, primarily within the southern portion of the Site near the fenceline.

Vegetation in the pond and swale area was performing well with the exception of the volunteer red alder and some of the planted willows (Photograph 5). Trees and shrubs ranged from 10 to 20 or more feet in height (Photograph 6). Several dead alder and willow shrubs were observed within the northern and eastern portion of this area. Plant loss is attributed to the dominance of sandy soil and lack of moisture retention. However, this area continues to function as intended and the remaining shrubs provide adequate coverage. We anticipate that many of the dead and/or dying willow and alder will regenerate within this area. Limited areas containing water plantain, slough sedge, and other emergent vegetation were present. The majority of the herbaceous and emergent plantings in this area did not survive due to the sandy nature of the soil, which does not provide adequate moisture retention and inundation to support all of the originally installed plant species during the dry months of the year; however, other species are well established and replanting is not needed at this time. No noxious weeds were observed in this area.

The grassland species on the impermeable cap provided excellent coverage of the ground (Photographs 7 and 8). Gumweed was observed along the southwestern edge of the impermeable cap and provides increased diversity in this area. The remaining grasses and herbs were thriving. Moss was present in localized areas in the central portion of this zone where grasses and herbs did not become established. Limited quantities of knapweed, thistle, and skeletonweed were observed within the southwestern portion of this zone.

The Upland Area components were performing well with the exception of small areas of alder and willow in the stormwater retention pond and areas. Groundcover (herbaceous) species provide excellent coverage of the ground with the exception of a few areas containing bare ground and the relatively bare understory in the pond area. Limited quantities of noxious weeds were observed in the upland and were primarily limited to the southwestern edge of the impermeable cap.

4.2 Riparian Area

At the time of the fall inspection, water levels in the Willamette River were low, and the mid- to upper-beach face was exposed (Photograph 9). The species originally installed in the lower Riparian component continued to perform well over the summer months (Photograph 10). Many of the trees and shrubs planted in this area have reached a height of 6 to 9 feet tall and continue to grow vertically and branch out laterally. As the tree species continue to develop, they will increase shading along the shoreline of the river. No dead trees or shrubs were observed in this area. A few Oregon ash and black hawthorn plants showed signs of stress, likely attributed to dry conditions, which typically occurs in the late summer to early fall. The individual species identified during our baseline site visit were present with a few volunteer red alder and black cottonwood saplings colonizing the area between the upper and lower Riparian area. A notable amount of thistle was observed throughout the lower Riparian component. Very small quantities of knapweed and butterfly bush were present and did not appear to be colonizing other locations in the area.

Native trees and shrubs in the upper Riparian component also appeared to be performing well. Grand fir, madrone, Nootka rose, snowberry, Oregon-grape, and elderberry appeared well established and performing the best within this area. Individual plants, including oceanspray, cascara, twinberry, and ninebark appeared stressed. However, these species and other plantings originally installed in this area were generally healthy, well rooted, and growing vertically and laterally. Groundcover plantings also appeared healthy. Limited areas of bare ground were observed. Similar to the lower component, thistle was the

most notable noxious weed with lesser quantities of knapweed and butterfly bush present in localized areas.

The upper and lower Riparian components were performing well with trees and shrubs spreading. Groundcover species provided good coverage of the Site soils with the exception of a few small areas of bare ground. Large wood was present along the shoreline to the middle of the bank near the break between the upper and lower Riparian areas (Photograph 11). This large wood provides habitat for birds, small mammals, and other wildlife using this portion of the Site. Thistle continues to colonize the Riparian area and is a target species for noxious weed control efforts. Knapweed and butterfly bush are also present in lesser quantities.

5.0 NOXIOUS WEED CONTROL

A preventative noxious weed control approach continues to be implemented as part of an ongoing effort to control the spread of noxious weed species. Ongoing spot-spraying and manual pulling is being completed on a semi-annual basis by Ecosystems Northwest under subcontract to Hart Crowser. The scope of work includes completing application (spot spraying) of Glyphosate herbicide and manual hand pulling to mitigate thistle, knapweed, Scotch broom (*Cytisus scoparius*), sweet clover (*Melilotus* sp.), mustards (*Brassica* sp.), and other noxious weeds at the Site. Noxious weed control activities were completed in April and October 2011. Fall 2011 noxious weed control efforts focused on controlling thistle within the Riparian Area as well as other noxious weeds identified during the quarterly site inspection conducted in the fall of 2011.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The tree, shrub, and groundcover plantings continue to perform well throughout the Site. A limited number of stressed, dead or apparently dying plants were observed. Vegetation performance in 2010 and 2011 indicate irrigation is not needed, and decommissioning of the irrigation system is scheduled for 2012. Some volunteer species were noted, and will help to increase species diversity where present at the Site. Groundcover species provide excellent coverage. Noxious weeds continue to be a problem, and will require ongoing management and control to prevent them from colonizing larger areas. Thistle and knapweeds were the most notable noxious weeds observed in 2011. Semi-annual noxious weed control activities are recommended, primarily in the Riparian area, to maintain a thriving and functional riparian habitat. Additionally, semi-annual inspections should be continued in 2012 to assess and monitor

vegetation planting areas, specie identification (native, non-native, and invasive), growth, density, and general coverage throughout the Site.

7.0 REFERENCES

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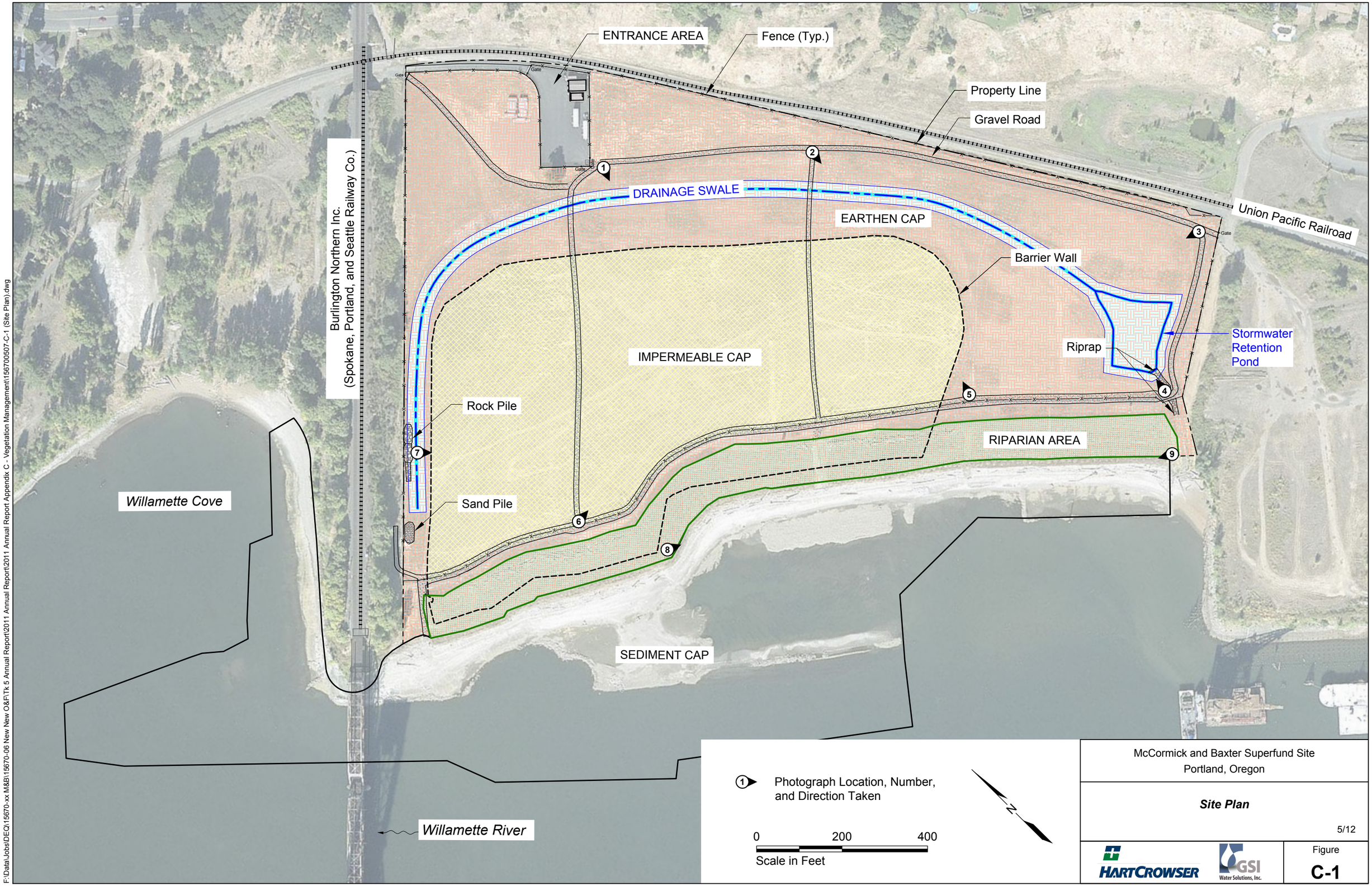

McCormick and Baxter Superfund Site
Portland, Oregon

Site Plan

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HARTCROWSER

GSI Water Solutions, Inc.

Figure
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ATTACHMENT A
PHOTOGRAPH DOCUMENTATION

OPERATION AND MAINTENANCE REPORT
JANUARY 2011 TO DECEMBER 2011
MCCORMICK AND BAXTER SUPERFUND SITE
PORTLAND, OREGON

Photograph 1 – Ground mammal burrows observed on the earthen cap (September 2011).

Photograph 2 – Earthen cap and drainage swale in the foreground with the impermeable cap in the background. Photograph taken from Photo Station 1 looking south.
(Left - June 2011; right - September 2011)

Photograph 3 – Tree and shrub plantings on the earthen cap are healthy and spreading. Photograph taken from Photo Station 2 looking south (September 2011).

Photograph 4 – Eastern edge of the earthen cap with perimeter road in foreground. Photograph taken from Photo Station 3 looking west (September 2011).

Photograph 5 – Stormwater pond dominated by willow and alder. Photograph taken from Photo Station 4 looking north (Left – June 2011; right – September 2011).

Photograph 6 – Willow plantings on the earthen cap. Photograph taken from Photo Station 5 looking northeast (September 2011).

Photograph 7 – Impermeable cap in the early summer (left) and late summer (right). Photograph taken from Photo Station 6 looking east (Left – June 2011; right – September 2011).

Photograph 8 – Impermeable cap is dominated by grasses and herbaceous vegetation. Photograph taken from Photo Station 7 looking southeast (Left – June 2011; right – September 2011).

Photograph 9 – Vegetation growth within the lower riparian component. Photograph taken from Photo station 8 looking south (September 2011).

Photograph 10 – Upper riparian component with trees, shrubs, and herbaceous plants. Photograph taken from Photo Station 5 looking southwest (Left – June 2011; right – September 2011).

Photograph 11 – Lower riparian component with large wood along the edge. Photograph taken from Photo Station 9 looking northwest (Left – June 2011; right – September 2011).